

FINAL REPORT

A STUDY OF MULTI-DAY STORAGE PATTERNS FOR GASOLINE-FUELED VEHICLES IN THE SOUTH COAST AIR BASIN

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ABSTRACT

New evidence indicates that extended periods of vehicle non-use contribute to overloading the vapor trapping canister in a vehicle and resulting in excess emissions. To incorporate this finding into the ARB's emission model, the Air Resources Board (ARB) is currently developing improved methods of estimating evaporative emissions from on-road gasoline-fueled motor vehicles in the South Coast Air Basin. Critical factors in determining evaporative emissions are the duration and frequency of "multi-day" vehicle storage, lasting 24 hours or longer. To quantify these critical factors for all gasoline-fueled vehicles in the Basin, Valley Research Corporation (VRC) conducted several surveys on storage patterns of both individually-owned vehicles and commercially-owned vehicles. Specifically, VRC designed and implemented the following surveys:

1. Household Survey for individually-owned vehicles;
2. Business Vehicle Survey for both fee-paid and fee-exempt vehicles with commercial license tags; and
3. Facility Survey for unregistered, new vehicles at car dealers and registered vehicles at various facilities such as auto-repair and body shops, and parking and camping facilities.

These surveys have revealed that, of the basinwide population of 8.1 million privately owned vehicles, there are about 2.1 million vehicles daily experiencing multi-day soaking. For the estimated population of 374,000 commercially-owned vehicles in the basin, there are 137,000 (37%) vehicles daily experiencing multi-day soaking. Of these privately- and commercially-owned vehicles on multi-day soak, about 7 percent are soaking at vehicle holding facilities such as auto-repair shops and parking lots. In addition to these vehicles in circulation, there are 154,000 new, pre-registered vehicles soaking for multi-days at new car preparation lots and vehicle dealers.

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1.0 INTRODUCTION

1.1 BACKGROUND AND STUDY OBJECTIVE

The Air Resources Board is currently developing improved methods of estimating evaporative emissions from on-road gasoline-fueled motor vehicles in the South Coast Air Basin (SoCAB). Important factors in determining evaporative emissions are the duration and frequency of periods of non-use. In particular, it is important to know the distribution of storage periods exceeding 24 hours (herein called "multi-day storage" or "multi-day soaks"). Currently the emissions from on-road motor vehicles are estimated for SoCAB using the Direct Travel Impact Model (DTIM) developed by California Department of Transportation (CALTRANS). DTIM uses ARB's emission factor model EMFAC7d (ARB 1988) and the vehicle activity model developed by Southern California Association of Government (SCAG). The vehicle activity model developed by SCAG does not estimate the number of vehicles experiencing multi-day soaks.

In 1976, the California Department of Transportation (CALTRANS) and the Southern California Association of Governments (SCAG) jointly conducted an extensive origin-destination survey (Davis 1976) to describe the spatial and temporal patterns of motor vehicle and mass transit usages in CALTRANS' District 7, which roughly corresponds to the South Coast Air Basin (SoCAB). More recently, driving and storage patterns of privately-owned motor vehicles were surveyed over the entire SoCAB under the ARB-funded "Nonprimary Vehicle Usage Study" (Horie and Cassmassi 1981). Using results of these surveys, ARB's preliminary estimates suggest that on an average day, as many as 20 to 30 percent of all gasoline-fueled vehicles in the SoCAB may be soaking for more than 24 hours, which creates the following problem.

Vehicle evaporative emission control systems contain canister devices which trap and store vapors when vehicles are not in operation. Later, when a vehicle is operating, these vapors are drawn into the engine to be burned, thereby reducing the release of fuel vapors to the atmosphere. However, the storage capacity of the canister is limited. Recent ARB (1986) vehicle emission test data have shown that extended periods of non-use contribute to overloading the canister and resulting in excess emissions. This excess emission

potential, combined with the estimated high percentage of vehicles having multi-day soaking periods, may lead to a substantial amount of vehicle-evaporative emissions. Since these emissions are now not properly accounted for either in EMFAC or in DTIM, current ARB estimates are most likely underestimated for this important source of organic emissions.

The objective of this study is "to characterize the frequency, soak duration and soak locations of all gasoline-fueled on-road vehicles soaking for multiple days in the SoCAB."

1.2 SUMMARY OF FINDINGS

To achieve the study objective, Valley Research Corporation (VRC) designed and implemented the following surveys:

1. Household Survey. Storage patterns of privately-owned vehicles were surveyed by telephone for 500 randomly selected households in the SoCAB, using a specially devised random digit dialing method. Selected vehicles at these households were further surveyed by having the vehicle operators maintain a diary of vehicle non-uses over an 8-day period.
2. Business Vehicle Survey. Storage patterns of commercially-owned vehicles (i.e., those owned by organizations) were surveyed by telephone for 100 fee-exempt vehicles, 200 fee-paid small trucks (e.g., pickups, vans, panel trucks, etc.), and 100 fee-paid full trucks, which were selected from the Department of Motor Vehicles (DMV) records according to a stratified random sampling method.
3. Facility Survey. Storage patterns of vehicles were surveyed by telephone for 50 vehicle dealers, 40 rental and lease agents, 130 auto repair and body shops, 40 scrap and dismantling places, and 40 parking and camping facilities. A follow-up survey using a survey postcard was also administered to some of the surveyed facilities on a voluntary basis.

Design aspects of these three surveys are discussed in Section 2. Details of the three surveys and their results are described, respectively, in Sections 3, 4 and 5. Highlights of VRC's experience and findings in the three surveys are set forth in the following paragraphs.

1.2.1 HOUSEHOLD SURVEY FINDINGS

- "Directory-Assisted Random Digit Dialing" survey procedure was devised and applied to 528 randomly selected households with telephones in the SoCAB.
- The overall completion rate of the survey was 44 percent, including 76 households which were found not to have any motor vehicles.
- Of the 452 households with one or more vehicles, 67 percent were in single detached houses, 21 percent in apartments or duplexes, 8 percent in condominiums or townhouses, and 4 percent in other types of residences.
- The average numbers of licensed drivers and motor vehicles per household were 2.11 and 2.06, respectively.
- The median model year of 907 gasoline-fueled vehicles in the survey sample was 1983 (5 years old) while the mean vehicle age was 7 years.
- About two thirds of all gasoline-fueled vehicles were unused for at least one full day during the week. These vehicles contained about a half tankful of gasoline (61%) and were parked predominantly in enclosed garage or shaded area (63%).
- About a third of the vehicles had ever been left overnight at auto repair facilities. About a half of such vehicles were left there more than 6 months earlier and for less than 48 hours.
- The percentages of vehicles left overnight at parking lots and recreational places were 16 percent and 8 percent, respectively. A great majority of these vehicles were left overnight there one month or more earlier.
- The percentage of vehicles unused for 24 hours or more at the time of interview was 18 percent, of which more than half had been unused for a week or more.
- According to the household survey, the percentages of all vehicles soaking for 24 hours or longer were about 23 percent on a weekday and 31 percent on a weekend.
- The percentage of vehicles soaking for a given period decreased as the soak period increased: 34% on 1-day soak, 22% on 2-day soak, 12% on 3-day soak, and 32% on 4-day or longer soak.
- According to the diary survey conducted subsequently, the percentage of vehicles daily experiencing multi-day soaking was 19 percent while that of corresponding vehicles in the Household Survey sample was 21 percent.
- With the basinwide population of 8.1 million privately-owned vehicles, the number of vehicles daily experiencing multi-day soaking was estimated to be 2.1 million (25%).

1.2.2 BUSINESS VEHICLE SURVEY FINDINGS

- Commercially-owned vehicles were identified by examining owners' names of some ten thousand vehicles which had been selected randomly from the DMV-provided vehicle registration records of 108,000 fee-exempt vehicles and 1.5 million fee-paid, commercial licensed vehicles in the SoCAB.
- The number of commercially-owned vehicles in the SoCAB was estimated to be 374,000 (as of July 1987). There were about 1.1 million vehicles which were commercially licensed but privately owned. These were mainly pickups and vans and are assumed to be accounted for by the Household Survey.
- The median model year of 410 vehicles in the survey sample was 1982 (7 years old): 4 years for fee-exempt vehicles, 5 years for fee-paid small trucks, and 10 years for fee-paid full trucks.
- The ownerships of these vehicles were 32 percent for services and public administration, 30 percent for construction and manufacturing, 17 percent for transportation and public utilities, and 21 percent for others.
- About 60 percent of commercially-owned vehicles were unused for at least one full day during the week. These vehicles contained about a half tankful of gasoline (58%) and were parked predominantly outdoors, exposed to the sun (74%).
- The percentage of vehicles unused for 24 hours or more at the time of interview was 17 percent, of which about two thirds were unused for a week or more.
- About two thirds of the vehicles had ever been left overnight at auto repair facilities. More than two thirds of such vehicles were left there more than 6 months earlier and for less than 48 hours.
- The percentage of commercially-owned vehicles left overnight at parking lots and recreational places was only 7 percent.
- The percentages of all commercially-owned vehicles unused for 24 hours or more were 21 percent on a weekday, 75 percent on a weekend, and 37 percent for all days.
- Of these vehicles unused for 24 hours or more, 36 percent were on 1-day soak, 29 percent on 2-day soak, and 35 percent on 3-day and longer soaks.
- With the basinwide population of 374,000 commercially-owned vehicles, the number of commercially-owned vehicles daily experiencing multi-day soaks was estimated to be 138,000.

1.2.3 FACILITY SURVEY FINDINGS

- Using the list of business names purchased from Dun's Marketing Services, a total of 317 business establishments were surveyed to obtain vehicle storage patterns at their facilities.
- Of the 317 completed interviews, 67 facilities were found not to store any vehicle, leaving 250 facilities with one or more vehicles.
- The 250 surveyed facilities with vehicles were distributed as: 36 new and used vehicle dealers, 38 vehicle rental and lease agents, 131 auto repair and body shops, 5 scrap and dismantling yards, and 40 parking and campground areas.
- The estimated numbers of vehicles daily experiencing multi-day soaking at these facilities are: 205,000 at new and used vehicle dealers, 22,000 at vehicle rental and lease agents, 53,000 at auto repair and body shops, 1,000 at scrap and dismantling yards, and 12,000 at parking and camping areas.
- Of the 205,000 vehicles experiencing multi-day storage at vehicle dealers, two thirds were new pre-registered vehicles and one third used vehicles.

2.0 SURVEY DESIGN

2.1 OVERVIEW

Determining storage patterns of gasoline-fueled on-road vehicles in the SoCAB might seem simple. However, such a determination involves many survey- and data-related problems. Some of the problems are:

1. Storage patterns and vehicle type mixes of privately-owned vehicles and commercially-owned vehicles are expected to be different. But the DMV registration records do not distinguish vehicles owned by individuals from those owned by organizations.
2. Prolonged multi-day vehicle storage can take place not only at the owner's residential location but also at various other locations such as airport parking, auto-repair shop, and camp grounds. Therefore, to obtain spatial distribution of vehicles experiencing multi-day storage requires a separate survey on vehicles at these facilities as well.
3. Unregistered vehicles at new car dealers and new car preparation lots may contain some gasoline and soak for many days before they are sold. Therefore, both the number of such unregistered vehicles and their soak durations must be determined. Similarly, fleet sizes and soak durations of vehicles at used car dealers and rental and leasing agents must also be determined.

In order to address various problems as outlined above, VRC carefully designed and implemented the following surveys:

Household Survey to obtain storage patterns of privately owned vehicles;

Business Vehicle Survey to obtain storage patterns of commercially-owned vehicles including both fee-exempt vehicles and fee-paid vehicles with commercial license plates; and

Facility Survey to estimate both the numbers and storage patterns of registered and unregistered-vehicles at selected types of facilities such as car dealers, rental and leasing agents, auto-repair and body shops, scrap and dismantling yards, and parking and camping facilities.

2.2 PRIVATELY-OWNED VEHICLES

Privately-owned vehicles constitute a great majority of the motor vehicles in circulation. For the purposes of this study, they are defined as vehicles owned by individuals and operated primarily for personal uses (not for business uses). Vehicles are normally registered in the DMV either as "automobile" (having auto license plates), as "commercial" (having commercial license plates), or as "motorcycle" (having motorcycle license plates). In DMV classification, "commercial" vehicles are all those vehicles whose bodies are designed for purposes other than regular passenger uses. Therefore, mini-vans are "automobile" whereas pickups are "commercial". It should be noted that "commercial" vehicles in the DMV classification are totally different from "commercially-owned vehicles" in this study.

To obtain a representative sample of individually-owned vehicles, an all-inclusive sampling frame was sought. From practical considerations, it was decided that households with telephones (regardless of "listed" or "unlisted") in the SoCAB would be a reasonable frame for selecting survey samples, even though with this sampling frame, there would be slight biases toward omission of households with no telephones and toward oversampling of households with multiple telephones.

We suppose that the number of vehicles at a household with multiple telephones tends to be greater than the average number of vehicles per household whereas that at a household with no telephone tends to be less than the average. Therefore, these perceived biases may partially offset each other in terms of the number of vehicles at surveyed households.

Initially, a pure random-digit dialing survey was attempted to find and interview households on their motor vehicles. However, this survey method turned out to be very inefficient because too many non-working numbers and business numbers were encountered. At the suggestion of a CALTRANS survey expert, a directory-based random-digit survey procedure was devised and applied to select survey households. The procedure was as follows:

1. Telephone Directory. Acquire the telephone directories covering the entire SoCAB. There were 16 directories covering the region, as shown in Table 2-1.

TABLE 2-1. TELEPHONE DIRECTORIES AND TARGET SAMPLES OVER THE SoCAB

<i>Telephone Directory</i>	<i>White Page* First:Last</i>	<i># White Pages*</i>	<i>Phone No. Samples</i>	<i>Target # Samples</i>
1. Santa Clarita Valley	7:120	114	22	6
2. Northwestern Area	11:1131	1,121	223	60
3. Western Area	11:678	668	133	35
4. Los Angeles	17:1268	1,250	250	67
5. Airport Area	11:605	595	117	32
6. Mid-Cities	11:459	449	87	24
7. South Bay	13:623	611	120	32
8. Long Beach	1:550	540	109	29
9. Northeastern	13:995	983	195	52
10. Pomona	6:450	445	88	24
11. Orange County N & Central	1:1376	1,363	270	73
12. Orange County S & Coast	9:358	350	69	19
13. San Bernardino	1:322	313	62	17
14. Redlands	4:124	121	24	6
15. Riverside	9:184	176	35	9
16. Hemet	4:275	273	53	15
SoCAB Total		9,372	1,857	500

* Excluding government pages.

2. Skip Interval. Calculate the total numbers of white pages in the directories and determine a skip interval. There were 9,372 white pages in the 16 directories, excluding those for governmental listings. To ensure 500 completed interviews, about 2,000 samples were needed. Therefore, the skip interval was computed to be 5 (9,372/2,000) pages.
3. Preliminary Number. For a random start, select a directory page number not over the skip interval(s) and select the first residential telephone number you come to. This is the preliminary number, not a number to be dialed. Selection of further pages is made in the following manner: Let Pg and Pa be, respectively, the numbers of pages for governmental listings and business listings that start

with the alphabet A. And let S be the skip interval. Then, the k-th selected page is given by:

$$P_k = P_g + P_a + kS - (S-R) \quad (k = 1, 2, \dots)$$

where R is a random number selected from the interval, 1 to S. The number of samples selected from each directory is given in Table 2-1.

4. Revised Number. In order to acquire unlisted as well as listed telephone numbers, increase the next to the last digit by one (namely, add 10). This revised number is the number called.
5. Substituted Number. If the number called does not yield a completed interview (because of disconnected phones, phones out of order, refusals, etc.), increase the last digit of the number by one, until a completed interview is acquired.

EXAMPLE: Preliminary Phone Number -- 361-8046 (Listed but not called)

Revised Phone Number -- 361-8056 (called but turned out to be a disconnected phone)

Substituted Phone Number -- 361-8057 (Turned out to be a refusal)

Re-Substituted Phone Number -- 361-8058 (Finally successful)

6. Non-Residential Number. If the number called is found to be a non-residential number, replace the number with the next number in the list. Example: Business number and government number.

2.3 COMMERCIALLY-OWNED VEHICLES

In this study, commercially-owned vehicles are defined as those vehicles owned and operated by organizations. There are two registration types for commercially-owned vehicles: fee-paid and fee-exempt. Although DMV registration records provide a ready identification of fee-exempt vehicles (i.e., those of governmental agencies and public institutions), they do not distinguish fee-paid commercially-owned vehicles from privately owned vehicles. DMV determination of license plate types is based on the original design of the vehicle, independent of ownership or of how it is used:

- Auto license plates for passenger-oriented vehicles; and
- Commercial license plates for non-passenger-oriented vehicles.

To estimate the total number of commercially-owned vehicles in the SoCAB, VRC obtained the latest registration records for both fee-exempt vehicles and fee-paid vehicles with commercial license plates through the ARB-DMV interagency cooperative service. Numbers of registration records by types of license and vehicle are given in Table 2-2, which shows that there are 1.5 million commercial-licensed vehicles and 58,000 fee-exempt vehicles in the SoCAB. Of commercial-licensed vehicles, a great majority are small trucks (1.4 million), a category that includes pickups, vans, station wagons, panel trucks, taxis, limousines, and ambulances.

TABLE 2-2. NUMBERS OF DMV REGISTRATION RECORDS BY TYPES OF LICENSE AND VEHICLE (Excluding all fee-paid autos).

<i>Item</i>	<i>* Vehicles (in 1,000)</i>
Total Number of Records	2,234
# Non-Gasoline-Fueled Vehicles	139
# Expired Registration Vehicles*	535
# Gasoline-Fueled Current Registration Vehicles	1,560
Fee-Exempt Vehicles	
Autos	27.7
Trucks**	27.8
Motorcycles	27
Total Fee-Exempt Vehicles	58.2
Fee-Paid Vehicles	
Small Trucks***	1,407.3
Fuel Trucks and Buses	94.1
Motorcycles and Unclassified	0.1
Total Fee-Paid Vehicles	1,501.5

* Vehicles whose registrations expired before January 1988.

** Include all vehicles other than autos and motorcycles

*** Include pickups, vans, station wagons, panel trucks, taxis, limousines, and ambulances

We suspected that most of these small trucks were privately-owned vehicles rather than commercially-owned vehicles. Therefore, twenty times

as many vehicles as the target sample size of 200 small trucks were selected from the fee-paid vehicle data base to ensure that an adequate number of "qualified" (i.e., commercially-owned) small trucks would be available for the business vehicle survey. We determined whether any selected small truck was a commercially-owned vehicle or not by examining the name of the vehicle owner:

- If the name was that of an individual, the vehicle was judged to be a privately-owned vehicle; and
- If the name was that of a firm, the vehicle was judged to be a commercially-owned vehicle.

Table 2-3 shows the numbers of initial selections and target samples for fee-exempt and fee-paid vehicles. In order to obtain adequate amounts of storage pattern data for both fee-exempt and fee-paid vehicles, we decided to complete the business-vehicle survey on 100 fee-exempt vehicles and 300 fee-paid vehicles. To ensure such target numbers of survey completions, we selected larger initial numbers of small trucks than of other vehicles in the survey. As shown in the table, the initial selection of 4,000 small trucks yielded only 468 "qualified" vehicles, which in turn yielded 321 vehicles with owners identified by phone numbers. This number was barely adequate to complete the survey with the target number of 200 small trucks.

Telephone numbers of the organizations owning the "qualified" vehicles were identified from their names and addresses through appropriate telephone directories. Unlike households, few organizations had unlisted phone numbers (see Table 2-3).

TABLE 2-3. LIST OF VEHICLES SELECTED FOR BUSINESS VEHICLE SURVEY

<i>Vehicle/License Type</i>	<i># Vehicles in SoCAB</i>	<i># Initial Selections</i>	<i># Qualified Vehicles</i>	<i># Samples w/Phone</i>	<i>Target # Samples</i>
<i>Fee-Exempt Vehicles</i>					
Autos	27,700	142	142	138	47
Commercial	27,800	143	143	137	48
Motorcycles	2700	15	15	15	5
Exempt Total	58,200	300	300	290	100
<i>Fee-Paid Vehicles</i>					
Small Trucks*	1,407,300	4,000	468	321	200
Full Trucks	94,100	315	315	191	100
Fee-Paid Total	1,501,500	4,315	666	431	300

* Include pickups, vans, station wagons, panel trucks, taxis, limousines, and ambulances.

2.4 VEHICLES AT HOLDING FACILITIES

Privately-owned vehicles and commercially-owned vehicles together account for all vehicles in circulation. However, this study also concerns "pre-registered" vehicles at new car dealers and car preparation lots and retired vehicles at scrap and dismantling yards if they contain gasoline in their fuel tanks. These new and retired vehicles should be included among vehicles under consideration if they are not accounted for in the DMV vehicle registration records.

In addition to these vehicles not covered by registration as privately or commercially owned, many of the privately- and commercially-owned vehicles may be stored at least temporarily at various holding facilities such as parking lots, auto-repair and body shops, new and used car dealers, rental and leasing agents, scrap and dismantling yards (e.g., impounded cars), and camp grounds.

All vehicles except unregistered vehicles at these holding facilities are registered as either privately or commercially owned. However, they are temporarily stored in these facilities and many of them may be in multi-day

soaking periods. These vehicles having multi-day soaking periods at holding facilities can have a significant effect on spatial distributions of privately- and commercially-owned vehicles having multi-day soaking periods.

Therefore, the purposes of the facility survey are to estimate the numbers of vehicles by vehicle and registration types and characterize their multi-day soaking patterns at facilities of:

1. New and Used Vehicle Sales
2. Vehicle Rental and Lease
3. Auto-Repair and Body Shops
4. Scrap and Dismantling Yards
5. Parking and Camping Areas

Unlike households in the household survey and DMV-registration-identified vehicles in the business vehicle survey, facilities classified by the above five categories are not necessarily mutually exclusive. For example, a new car dealer providing auto-repair service could and should be counted twice: once as a new and used car dealer, and again as an auto-repair and body shop.

In order to account properly for all facilities in each of the five business categories, a list of business establishments whose primary or secondary activities were in one of the five categories was purchased from Dun's Marketing Services (DMS). The total numbers of facilities having their primary or secondary business activities in the five business categories in the SoCAB are given in Table 2-4. In all, nearly 18,000 facilities are engaged in these five categories for their primary business whereas only 3,500 facilities have such categories for their secondary business activities. (N.b., the term "secondary business" covers all activities from the second-largest revenue-generating business through the 6th-place business in each business establishment.)

**TABLE 2-4. NUMBER OF FACILITIES ENGAGING THEIR PRIMARY
OR SECONDARY BUSINESS ACTIVITIES IN FIVE BUSINESS
CATEGORIES IN THE SoCAB (as of July, 1988).**

Business Type	Standard Industrial Codes	Primary* Facilities	Secondary** # Facilities	DMS Records*** Purchased	Target# # Samples
1. New And Used Vehicle Sales	5511, 5521, 5561, 5571	2,284	339	379	50
2. Vehicle Rental and Lease	7512, 7513, 7519	1,066	234	324	40
3. Auto Repair and Body Shop	5541, 7531, 7535, 7538, 7539, 7549	11,645	1,788	1,178	130
4. Scrap and Dismantling	5093, 5931	2,201	1,007	297	40
5. Parking and Camping	7032, 7033, 7523, 7525	377	90	322	40
Total		17,573	3,458	2,500	300

* The number of facilities whose primary business activities are in designated SIC's

** The number of facilities whose secondary business activities are in designated SIC's

*** Dun's Marketing Service business establishment records.

Table 2-4 also shows the number of DMS business records purchased and the target number of completed interviews in each of the five business categories. In total, 2500 DMS business records were purchased to ensure that 300 completed telephone questionnaire interviews would be accomplished among those business establishments.

3.0 HOUSEHOLD SURVEY

A telephone questionnaire survey on storage patterns of privately-owned gasoline-fueled vehicles was attempted for 1198 randomly selected households with telephones and was completed for 528 households. These households were selected and interviewed according to the directory-based random-digit survey procedure which is described in Section 2.2. To 325 respondents who expressed interest in a subsequent diary survey, we mailed a post card diary for recording periods of vehicle non-use over an 8-day period. Of them, 141 returned the completed diary. Details of these two surveys are discussed in sections that follow.

3.1 QUESTIONNAIRE FOR HOUSEHOLD SURVEY

In asking about vehicle storage patterns, three types of questions are useful:

1. Questions about current status of vehicle use (or non-use);
2. Questions about actual vehicle uses over a certain period such as past 24 hours and past 7 days; and
3. Questions about typical vehicle use patterns over a long period such as month, season, year.

Theoretically, the first type of question would yield the most accurate data about vehicle storage patterns because a great majority of interviewees should know the current use status of their vehicles and thus could provide accurate answers to the questions. However, this method would require a large number of interviews to obtain a representative storage pattern for the entire vehicle population. Another drawback would be an accessibility bias. The more vehicles are in use, at any given time, the fewer candidate interviewees in the survey sample will be available for the interviews, and vice versa. As a result, vehicle storage patterns from such a survey would be skewed toward exaggerating vehicle non-use, e.g., by over-sampling the elderly and under-sampling working couples and singles.

The second type of question would yield reasonably accurate data about vehicle storage patterns as long as the time period is short enough for an

interviewee to accurately recollect past vehicle uses. The third type of question is not appropriate for a factual data gathering project like the present one because the question is more designed to elicit opinions than accurate answers.

We used primarily the second question type in phrasing vehicle non-use questions in all survey questionnaires under this study. The time period was limited to the last 8 days, including the day of the interview. Questions on past vehicle use (or non-use) were arranged and phrased in such a manner as to help the interviewee recollect past vehicle uses.

The questionnaire used for the household survey is shown in Appendix A. It consists of questions of the following types:

- Questions on the number of vehicles by type.
- Questions on past vehicle uses (or non-uses) for each vehicle.
- Questions on parking of the vehicle at particular types of facilities such as auto-repair and body shops, airport parking lots, and recreational areas.
- Questions on housing and family.
- Questions on interest in a subsequent diary survey.

3.2 SURVEY EXECUTION

Prior to engaging in telephone interviewing, every interviewer was briefed about rules of the random-digit dialing method and background information of this study. Both the rules and the background information sheet are shown in Appendix B. Each interviewer was given a call record sheet and a stack of the survey questionnaires.

The Call Record Sheet is illustrated in Figure 3-1. It provides the interviewer with both the telephone numbers to call and the space to record the date and result of each interviewing attempt. The phone numbers listed in the call record sheets were from telephone directories and used in the household survey generated according to the directory-based random-digit survey procedure described in Section 2.2.

CALL RECORD SHEET

Set No. 4

Target # Completions 67

Page 1 of 13

AC (213) Phone No.	Attempt 1			Attempt 2			Attempt 7			Comments
	Date	Time	R*	Date	Time	R*	Date	Time	R*	
465-0821	8/3	1100	N	8/13	1000	N	8/28	1106	N	
483-6524	8/3	1105	C							Mailing Address in San Bernad.
871-1987	8/3	1120	D	8/3	1122	D				Add 1, Add 2, Add 3
480-3114	8/3	1207	N	8/12	1202	C				
589-4258	8/3	1209	N	8/13	1210	N	8/28	1108	C	
653-3156	8/4	1148	BS							
684-6680	8/4	1150	N	8/22	0734	N	8/28	1130	C	

* Result of the attempt

Figure 3-1. Sample Call Record Sheet for Household Survey.

The household survey was started in late July and completed in early October, 1988. Results from the household survey are summarized in Table 3-1. In total, 1198 phone numbers were dialed and resulted in 528 completed interviews, reaching 455 households which had one or more cars and 76 households which had no cars.

The high proportion of households without cars may have been associated with the vacation season during which the survey was conducted. Residents of such households would tend to be at home more than those of households with cars during the season. Thus, they would be more accessible for random-digit dialing survey interviews. As shown in Table 3-1, the highest proportion of households without cars was found in Set 4 - downtown Los Angeles, followed by Set 8 - Long Beach and Set 3 - Western area (i.e., Santa Monica - Beverly Hills - Culver City). These high no-car household areas are matched with mass-transit developed areas in the SoCAB.

TABLE 3-1. SUMMARY OF TELEPHONE INTERVIEW OUTCOMES IN THE HOUSEHOLD SURVEY

Set* No.	Target Numbers	Phone # Dialed	# Completes		# Failures					Percent Complete
			W/Car	W/O Car	BS	DC	NA	R	L	
1	6	15	8	0	3	0	3	1	0	53
2	60	160	58	11	24	3	34	22	8	43
3	35	131	27	8	29	2	62	2	1	27
4	67	164	47	20	39	12	45	0	1	41
5	32	80	22	5	13	3	24	12	1	34
6	24	56	24	0	4	0	22	4	2	43
7	32	64	29	5	9	3	11	7	0	53
8	29	60	22	7	12	2	6	10	1	48
9	52	100	49	9	13	8	21	0	0	58
10	24	46	24	0	5	0	9	7	1	52
11	73	180	71	4	45	25	35	0	0	42
12	19	40	23	2	6	1	8	0	0	63
13	17	40	21	2	8	0	8	1	0	58
14	6	12	6	0	1	0	3	2	0	50
15	9	20	8	1	1	1	4	5	0	45
16	15	30	13	2	5	1	6	3	0	50
TOTAL	500	1198	452	76	217	61	301	76	15	44

NOTE: BS = Business, DC = Disconnected, NA = No Answer, R = Refusals, L = Language other than English and Spanish

* Telephone directory areas: 1 = Santa Clarita Valley, 2 = Northwestern Area, 3 = Western Area, 4 = Los Angeles, 5 = Airport Area, 6 = Mid Cities, 7 = South Bay, 8 = Long Beach, 9 = Northeastern, 10 = Pomona, 11 = Orange County N & Central, 12 = Orange County S & Coast, 13 = San Bernardino, 14 = Redlands, 15 = Riverside, and 16 = Hemet.

As to causes of failure in interview attempts, the dominant causes are no answers (often associated with answer machines) and business numbers. The refusal rate is rather small, 6 percent, as compared to the overall completion rate, 44 percent. Although this completion rate is somewhat low for a telephone questionnaire survey, it appears to be considerably higher than that of pure random-digit dialing. Using the same questionnaire, we conducted a pilot survey of 99 telephone numbers randomly drawn from 22 different prefixes and were able to achieve only 10 completions.

3.3 RESULTS OF HOUSEHOLD SURVEY

All questionnaire responses of the 452 households with one or more vehicles were encoded to generate two data files: a household file, containing data items for surveyed households, and a vehicle file, containing data items for vehicles identified at those households. Table 3-2 summarizes the types of housing and the numbers of residents and licensed drivers at the surveyed households.

TABLE 3-2. HOUSING TYPE MIX AND NUMBERS OF RESIDENTS AND LICENSED DRIVERS IN THE 452 SURVEYED HOUSEHOLDS
(All values in the number of households).

	<i>Single detached house</i>	<i>Apartment and duplex</i>	<i>Condo and townhouse</i>	<i>Mobile home</i>	<i>Other</i>	<i>No Answer</i>	<i>Total</i>
Housing Type	301	96	38	11	2	4	452
Percent*	67%	21%	8%	2%	1%	1%	100%

* Based on the number of households

	#Persons in Household						<i>No Answer</i>	<i>Total # Persons</i>	<i>Avg# Persons per Household</i>
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>>5</i>			
# Residents	68	132	97	91	37	20	7	1311	2.95
Percent**	5%	20%	22%	2%	14%	11%	-	100%	
# Lic. Drivers	99	244	74	24	4	3	4	946	2.11
Percent**	10%	52%	24%	10%	2%	2%	-	100%	

** Based on the number of persons.

The most common housing type among the surveyed households is single detached house (67%), followed by apartment and duplex (21%), condominium and townhouse (8%), and mobile home (2%). The average number of residents is 3 persons per household while that of licensed drivers is 2 persons per household. The medians are 4 residents per household and 2 licensed drivers per household, respectively.

3.3.1 VEHICLE MIX AND AGE DISTRIBUTION

In the 452 surveyed households, there were 931 motor vehicles of which 907 were gasoline-fueled vehicles. Table 3-3 shows the numbers of vehicles of the various types. Autos are the most common type, accounting for 81 percent of all vehicles and an equal fraction of all gasoline-fueled vehicles. The next most common vehicles are pickups (12%), followed by vans (5%). Diesel-fueled vehicles account for 2.6 percent of all vehicles. As to the registration status of these vehicles, 895 vehicles (99%) are California-registered, with 7 out-of-state vehicles and only 1 unregistered vehicle.

TABLE 3-3. MOTOR VEHICLES IDENTIFIED IN THE 452 SURVEYED HOUSEHOLDS.

<i>Vehicle Type</i>	<i>All Vehicles</i>	<i>Gasoline-Fueled Vehicles</i>	<i>Diesel Fueled Vehicles</i>
Auto	757	737	20
Van	47	47	-
Pickup	110	108	2
Motorhome	6	5	1
Motorcycle	5	5	-
Truck	5	5	-
Bus	1	-	1
Total	931	907	24
# Vehicles/household	2.06	2.01	0.05

Table 3-4 shows age distributions of the vehicles identified in the present survey and of those in the similar survey (Horie and Cassmassi 1981) conducted seven years ago for the same study area. Of the 907 gasoline-fueled vehicles, in the present survey sample, model years are known for 894. Percentages of the three most recent model years in the present survey sample are all higher than those in the previous survey sample: 8.0, 11.2 and 10.1 versus 4.2, 7.9 and 9.8. These higher percentages in the present sample may be attributable to the following circumstances:

1. Sales of new autos were better in the recent years 1986, 1987 and 1988 as compared to the relatively poor years 1979, 1980 and 1981; and

2. The present survey was conducted toward the end of the current model year (i.e., July through October 1988) whereas the previous survey was conducted in the middle of the 1981 model year (i.e., March through July).

TABLE 3-4. VEHICLE AGE DISTRIBUTIONS OF THE PRESENT AND PREVIOUS STUDY SAMPLES

<i>Present Study</i>			<i>Previous Study*</i>		
<i>Model Year</i>	<i># Vehicles</i>	<i>Percent</i>	<i>Model Year</i>	<i># Vehicles</i>	<i>Percent*</i>
1988	72	8.0	1981	56	4.2
1987	100	11.2	1980	106	7.9
1986	90	10.1	1979	131	9.8
1985	94	10.5	1978	144	10.8
1984	64	7.2	1977	104	7.8
1983	52	5.8	1976	86	6.5
1982	66	7.4	1975	55	4.1
1981	43	4.8	1974	101	7.6
1980	36	4.0	1973	87	6.5
1979	43	4.8	1972	97	7.3
1978	32	3.6	1971	55	4.1
1977	25	2.8	1970	66	4.9
1976	21	2.3	1969	72	5.4
1975	24	2.7	1968	48	3.6
1974	22	2.5	1967	23	1.7
1973	16	1.8	1966	20	1.5
1972	19	2.1	1965	21	1.6
1971	5	0.6	1960-64	36	2.7
1970	10	1.1	1959 and Older	27	2.0
1965-69	42	4.7			
1964 and Older	18	2.0			
Total			Total	1335	100
Median Model Yr. 1983			Median Model Yr. 1975		
Median Age**			Median Age**		
5 years			6 years		

* Nonprimary Vehicle Survey (Horie and Cassmassi 1981). However, this percent applies to all vehicles, not just to non-primary vehicles.

** Assuming that all latest model year vehicles are zero years old.

Because of the larger fraction of current model year vehicles in the present sample than in the previous sample, the median age of vehicles in the present sample is also one year younger than that of the previous sample: 5

years versus 6 years. However, the present survey sample also has a greater number of old vehicles than the previous survey sample, as evidenced in the percentages of the last few rows in the two age-distributions. The percentages of vehicles 17 years and older are 8.4% in the present study and 4.7% in the previous study.

To examine whether the population of vehicles in circulation is getting older in recent years, sample age distributions of vehicles in the three SoCAB-area surveys are compared in Table 3-5: the 1988 vehicle storage survey (this study); the 1981 nonprimary vehicle survey (Horie and Casmassi 1981); and a 1976 urban/rural survey (Lobb 1979). For ease of comparison, the vehicle age distributions are presented in the same format: vehicles in two consecutive model years up to the 14th model year and then all other vehicles with ages of 15 years or older. The percentages of this oldest vehicle group increased from each survey to the next: from 7.3% in the 1976 urban/rural survey, to 9.5% in the 1981 nonprimary vehicle survey, and to 14.8% in the present survey.

TABLE 3-5. COMPARISONS OF VEHICLE AGE DISTRIBUTIONS IN 1988 STORAGE SURVEY, 1981 VEHICLE SURVEY AND 1976 URBAN/RURAL SURVEY.

<i>Assumed Vehicle Age</i>	<i>1988 Storage Survey^a</i>		<i>1981 Vehicle Survey^b</i>		<i>1976 Urban/Rural Survey^c</i>	
	<i>Model Year</i>	<i>Percent</i>	<i>Model Year</i>	<i>Percent</i>	<i>Model Year</i>	<i>Percent</i>
1	1987-88	19.2	1980-81	12.1	1975-76	10.9
3	1985-86	20.6	1978-79	20.6	1973-74	19.3
5	1983-84	13.0	1976-77	14.3	1971-72	18.1
7	1981-82	12.2	1974-75	11.7	1969-70	16.2
9	1979-80	8.8	1972-73	13.8	1967-68	12.1
11	1977-78	6.4	1970-71	9.0	1965-66	10.1
13	1975-76	5.0	1968-69	9.0	1963-64	6.0
17	1974-Older	14.8	1967-Older	9.5	1962-Older	7.3
Mean Vehicle Age	7.0 years		7.3 years		6.9 years	
Adjusted Vehicle Aged	7.5 years		7.6 years		7.1 years	

^a The survey was conducted in July through October 1988

^b The survey was conducted in March through July 1981

^c The survey was conducted in January through June 1976

^d Vehicle age adjustment for each survey period: +0.5 year for (a), +0.3 year for (b), and +0.2 for (c)

In the table, mean vehicle-ages for three survey samples are also computed using the assumed ages of 1, 3, ..., 13 years for the seven 2-consecutive model year groups and the age of 17 years for all other older vehicles. Interestingly, the mean vehicle ages for the three survey samples are about the same: 7 years. The shifts in more recent vehicle-age distributions toward more newer vehicles and more older vehicles appear to have offset each other and to have resulted in nearly the same mean age in all three cases.

3.3.2 VEHICLE STORAGE PATTERN

As to vehicle storage patterns, the survey questionnaire asked three types of questions:

1. Storage patterns at vehicle owner's residence;
2. Last overnight storage events at auto-repair, parking, and recreational facilities; and
3. Actual vehicle uses on the day of interview and during the past seven days.

The first question was to obtain information on storage location (outdoor exposed, shaded area, or enclosed garage) and on fuel level in the tank when the vehicle was not in use. The second question was to obtain information on overnight storage events at auto-repair, parking and recreational facilities. This information could also supplement the facility survey, to be discussed later, which was specifically directed to vehicles at those facilities.

The third question was to obtain information on multi-day soaking of vehicles when not in use. Since the household survey relied on interviewees' recollections of past vehicle uses, a diary survey which asked the survey participants to record actual vehicle uses over an 8-day period was also distributed, for use on a voluntary basis.

3.3.2.1 Vehicle Storage at Residence

Table 3-6a provides a summary of vehicle uses during the last 24-hour period. These vehicle uses were the subject of two questions: (1) how many

times* the vehicle was used; and (2) how long ago the vehicle was last used. Of the vehicles for which these questions were answered, 162 (18%) were not used during the past 24-hours whereas 733 (82%) were used once or more often. A majority of them (53%) were used 2 to 4 times during the past 24 hours. As to the time of last use, 149 vehicles (17%) were being used at the time of interviews. A majority of the surveyed vehicles (66%) had been used during the past 24 hours whereas 162 vehicles (18%) had not been used for 24 hours or longer.

Durations of non-use for these 162 vehicles are summarized in Table 3-6b. Unfortunately, only 46 of them provided answers. Of the 46 vehicles, 21 (46%) had been used during the past week and 14 (30%) between the past one and two weeks. Eleven vehicles (24%) had not been used for longer than two weeks.

TABLE 3-6A. SUMMARY OF LAST VEHICLE USES DURING PAST 24-HOURS.

<i># Times Used during Past 24-Hrs.</i>			<i>Time of Last Vehicle Use</i>		
<i>Item</i>	<i># Vehicles</i>	<i>Percent</i>	<i>Item</i>	<i># Vehicles</i>	<i>Percent</i>
None	162*	18.1	Being used	149	16.5
Once	173	19.3	< 3 hours ago	287	31.7
2-4 times	473	52.8	< 12 hours ago	196	21.7
5 times or more	87	9.7	< 24 hours ago	111	12.3
			24 hrs or more	162*	17.9
Total response	895	100	Total response	905	100
No answer	12		No answer	2	
Grand total	907		Grand total	907	

*As expected, these numbers agree with each other.

TABLE 3-6B. NUMBER OF PREVIOUS DAYS UNUSED FOR THOSE VEHICLES UNUSED DURING PAST 24-HOURS.

<i>Duration</i>	<i># Vehicles</i>	<i>Percent</i>
One day	7	15.2
Two days	6	13.0
3-6 days	8	17.4
1-2 weeks	14	30.4
> 2 weeks	11	23.9
Total response	46	100
No answer	116	
Grand Total	162	

* The number of round trips unless the vehicle was parked longer than an hour during the trip.

We inquired about storage locations for those vehicles which had been unused for at least one day during the past seven days. Table 3-7A shows that of the surveyed vehicles, 334 (37%) had been used every day over the past seven days whereas 557 (63%) had not been used every day. Sixteen vehicles did not provide answers. During non-uses of the 557 vehicles, 252 (45%) were parked outdoors exposed to the sun, 71 (13%) were in shaded areas, and 234 (42%) in enclosed garages.

For the vehicles which were unused for at least one day during the past seven days, we asked about the level of fuel in their tanks as the time of their extended non-use. Table 3-7B shows that of the 555 vehicles whose owners responded to this question, 150 (27%) had nearly full tanks whereas 69 (12%) had nearly empty tanks. The majority (61%) had tanks about half full.

Table 3-7C shows storage locations of those vehicles whose owners had traveled out of the SoCAB during the past 30 days. Of the 907 surveyed vehicles, owners of 651 vehicles had not traveled. Of the remaining 256 vehicles whose owners had traveled, 95 vehicles were used for the travel whereas 161 vehicles were left unused during the travel. Of these 161 vehicles left unused, 74 (46%) were parked outdoors exposed to the sun, 16 (10%) in shaded areas, and 71 (44%) in enclosed garages.

**TABLE 3-7A. STORAGE LOCATIONS OF THOSE VEHICLES UNUSED
AT LEAST ONE DAY DURING PAST 7 DAYS**

<i>Response</i>	<i># Vehicles</i>	<i>Storage Location</i>	<i># Vehicles</i>	<i>Percent</i>
Used every day	334	Outdoor exposed	252	45.2
Unused at least a day	557	Shaded area	71	12.7
No answer	16	Enclosed garage	234	42.0
Grand Total	907	Total	557	100

TABLE 3-7B. FUEL LEVELS OF TANKS OF THOSE VEHICLES UNUSED AT LEAST ONE DAY DURING PAST 7 DAYS

<i>How Full</i>	<i># Vehicles</i>	<i>Percent</i>
About full	150	27.0
About 1/2 full	336	60.6
Nearly empty	69	12.4
Total response	555	100
No answer	2	
Grand total	557	

TABLE 3-7C. STORAGE LOCATIONS OF VEHICLES OUT OF THE SOCAB DURING PAST 30 DAYS

<i>Response</i>	<i># Vehicles</i>	<i>Storage Location</i>	<i># Vehicles</i>	<i>Percent</i>
Did not travel	651	Outdoor exposed	74	46.0
Used for travel	95	Shaded area	16	9.9
Stored during travel	161	Enclosed garage	71	44.1
Grand total	907	Total	161	100

It is interesting that the distribution of storage locations of these 161 vehicles left unused is nearly the same as that for the 557 vehicles shown in Table 3-7A.

3.3.2.2 Vehicle Storage at Facility

Multi-day soaking events of vehicles at places other than owners' residences were investigated in the household survey by asking interviewees questions on last overnight parking events at auto-repair facilities, parking lots, and recreational places such as campgrounds and ski resorts. Two types of questions were asked:

1. When did the last such event occur?
2. How long was the vehicle parked there?

Tables 3-8a and 3-8b show last times and durations of overnight parking at auto-repair facilities including body and paint shops. The number of vehicles ever left overnight at such facilities was 299 (33%), whereas 604 vehicles were never left overnight at those facilities. Of the 299 vehicles,

66 (22%) had been left overnight at repair facilities less than a month earlier while 86 (29%) had been left there between one month and six months earlier. Nearly half of the vehicles (i.e., 147 vehicles) had been left overnight at such facilities more than six months earlier.

TABLE 3-8A. LAST OVERNIGHT STORAGE AT AUTO-REPAIR FACILITIES

<i>Storage Status</i>	<i># Vehicles</i>	<i>Time of Last Repair</i>	<i># Vehicles</i>	<i>Percent</i>
Never left overnight	604	Right now	14	4.7
Ever left overnight	299	< 1 week ago	16	5.4
Total response	903	< 1 month ago	36	12.0
No answer	4	1-6 months ago	86	28.8
		> 6 months ago	147	49.2
Grand Total	907	Total	299	100

TABLE 3-8B. STORAGE DURATION AT AUTO-REPAIR FACILITIES

<i>Storage Duration</i>	<i># Vehicles</i>	<i>Percent</i>
< 24 hours	56	18.9
24-48 hours	111	37.5
3-6 days	65	22.0
1-2 weeks	40	13.5
> 2 weeks	24	8.1
Total response	296	100
No answer	3	
Grand Total	299	

As to storage durations of these 299 vehicles at auto-repair facilities, 56 (19%) were left less than 24 hours (e.g., in at 11 A.M. and out at 8 A.M. of the next day). The number of vehicles left for 24 to 48 hours was 111 (37%) while 65 (22%) were left for 3 to 6 days. The remaining 22 percent were left at repair facilities for more than 2 weeks.

Table 3-9 shows overnight parking events at parking lots, such as at airports and bus terminals. Of the 907 surveyed vehicles, only 142 (16%) were ever left overnight at parking lots, whereas the remaining 765 (84%) were never left overnight there. Among those ever left overnight, 22 (15%) had such events less than a month earlier, while 53 (37%) had been left one

to six months earlier. Nearly half of the vehicles (67) had been left in overnight parking more than six months earlier.

As to storage duration at parking lots, six vehicles (4%) had been parked overnight but left for less than 24 hours. A great majority of the vehicles (94%) had been left there for 1 day to 14 days: 32 vehicles for 24 to 48 hours, 65 vehicles for 3 to 6 days, and 34 vehicles for 1 to 2 weeks. Only 2 vehicles had been left for more than 2 weeks.

TABLE 3-9A. LAST OVERNIGHT STORAGE AT PARKING LOTS

<i>Storage Status</i>	<i># Vehicles</i>	<i>Time of Last Parking</i>	<i># Vehicles</i>	<i>Percent</i>
Never left overnight	765	Right now	4	2.8
Ever left overnight	142	< 1 week ago	8	5.6
Total response	907	< 1 month ago	10	7.0
No answer	0	1-6 months ago	53	37.3
		> 6 months ago	67	47.2
Grand Total	907	Total	142	100

TABLE 3-9B. STORAGE DURATION AT PARKING LOTS

<i>Storage Duration</i>	<i># Vehicles</i>	<i>Percent</i>
< 24 hours	6	4.3
24-48 hours	32	23.0
3-6 days	65	46.8
1-2 weeks	34	24.5
> 2 weeks	2	1.4
Total response	139	100
No answer	3	
Grand Total	142	

Table 3-10 shows overnight parking events at recreational places such as campgrounds, beaches, hotels, motels, and ski resorts. Of the 907 surveyed vehicles, only 76 vehicles (8%) had ever been left unused for 24 hours or longer at such recreational places. About half of these vehicles (39) had been left unused at campgrounds or parks. The other vehicles had been left at: beach or wilderness (11), hotel or motel (19), and ski resorts (7).

As to the time of the last such parking event, for a majority of the vehicles it had been more than a month earlier: for 31 (41%) 1 to 6 months earlier, and for 19 (25%) more than 6 months earlier. The other vehicles were reported: still parked (5); left less than a week earlier (8); and left less than a month earlier (13).

TABLE 3-10A. LAST OVERNIGHT STORAGE AT RECREATIONAL PLACES

<i>Storage Status</i>	<i># Vehicles</i>	<i>Percent</i>
Never left overnight	831	91.6
Ever left overnight	76	8.4
Total response	907	100

TABLE 3-10B. STORAGE LOCATION AND TIME OF LAST PARKING AT RECREATIONAL PLACES

<i>Location</i>	<i># Vehicles</i>	<i>Percent</i>	<i>Time of Parking</i>	<i># Vehicles</i>	<i>Percent</i>
Campground or park	39	51.3	Right now	5	6.6
Beach or wilderness	11	14.5	< 1 week ago	8	10.5
Hotel or motel	19	25.0	< 1 month ago	13	17.1
Ski resort	7	9.2	1-6 months ago	31	40.8
			> 6 months ago	19	25.0
Total	76	100	Total	76	100

3.3.2.3 Multi-Day Storage Frequency

The two preceding subsections discussed vehicle storage patterns at residences and selected facilities. However, the discussions are rather general and are not sufficiently specific for making quantitative estimates of the frequency and soak duration of privately-owned vehicles soaking for multi-days in the SoCAB. This subsection discusses multi-day soaking events of the 903 surveyed vehicles (907 less 4 with no answers to the past week use question, Q14).

To quantify soak duration, two new technical terms have been defined, as follows:

n-day diurnal --- soak duration of at least $24 \times n$ hours
($n = 1, 2, \dots$) but less than $24 \times (n + 1)$ hours; and

vehicle diurnals --- the sum of vehicles soaking for various numbers of days.

For example, a 1-day diurnal means a vehicle soaking for at least 24 hours but less than 48 hours. Two vehicle diurnals means two vehicles soaking for either the same number of days or two different numbers of days. If both vehicles soaked for two days (i.e., at least 48 hours but less than 72 hours), then we would say that there were two 2-day vehicle diurnals.

A determination of vehicle diurnals by soak duration for surveyed vehicles was not straightforward. In the survey questionnaire, daily vehicle uses were asked as to:

- (A) Driven in the morning
- (P) Driven in the afternoon
- (B) Driven in both the morning and afternoon
- (N) Not used at all

This question was asked for the day on which the interview was made (designated as D) and for seven days preceding it, D-1 through D-7.

Figure 3-1 shows how soak durations and vehicle diurnals were determined from the questionnaire responses. First, using a desk calendar, the vehicle uses on D, D-1, ..., D-7 are indicated on days of the week, Monday through Sunday. D-7 is the same day of the week as the interview date. In Fig. 3-1a, three illustrative examples are given. Vehicle I was driven in both the morning and afternoon on Monday through Friday. It was driven in Saturday morning. On Sunday, it was not driven at all. Therefore, one 1-day diurnal occurred to this vehicle on Sunday.

Vehicle II, on the other hand, was not driven at all except in the afternoon of Thursday. The interview was made on Friday. On D-7, the vehicle

was not driven. Therefore, one 1-day diurnal occurred on D-7, Friday of the previous week. It should be noted that this diurnal must not be included in vehicle diurnals on regular weekday/weekend days to prevent any effects of the days of interviews from resulting distribution of diurnals over days of the week. On subsequent days D-6 (Sat), D-5 (Sun), D-4 (Mon), D-3 (Tue), and D-2 (Wed), diurnals with soak durations of 2-, 3-, 4-, 5-, and 6-days occurred to this vehicle. No diurnal occurred on D-1 (Thu). One 1-day diurnal occurred on Friday, the day of the interview.

Fig. 3-1a.Determination of Soak Duration

<i>Interview</i>		<i>Date</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Sun</i>	<i>D-7</i>
Vehicle Use										
Vehicle I	Tuesday		B	<u>B</u>	B	B	B	A	N	B
Vehicle II	Friday		N	<u>N</u>	N	P	<u>N</u>	N	N	N
Vehicle III	Sunday		A	A	N	N	<u>P</u>	B	<u>N</u>	P
Soak Duration										
Vehicle I	Tuesday								1	
Vehicle II	Friday		4	5	6		1	2	3	1
Vehicle III	Sunday				1	2	3		1	

Note: A = Driven in the morning
P = Driven in the afternoon
B = Driven in both the morning and afternoon
N = Not used at all

Fig. 3-1b.Determination of Vehicle Diurnals

<i>Soak</i> <i>Duration</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Sun</i>	<i>Week</i> <i>Total</i>
1 Day			1		1		2	4
2 Days				1		1		2
3 Days					1		1	2
4 Days	1							1
5 Days		1						1
6 Days			1					1
7 Days								0
8 Days								0
Total	1	1	2	1	2	1	3	11

Figure 3-1. Illustrative Example of Determining Soak Duration and Vehicle Diurnals.

Vehicle III was unused on two consecutive days, Wednesday and Thursday. Therefore, 1- and 2-day diurnals occurred, respectively, on these days. On Friday, it was driven in the afternoon. Since the vehicle was not driven in the afternoon of Tuesday, it was concluded that a 3-day diurnal occurred to this vehicle on Friday. On Sunday, the day of the interview, it was not driven in either the morning or the afternoon. Thus, a 1-day diurnal occurred on that day.

Based on the diurnal determinations made for the three example vehicles, the numbers of vehicle diurnals were calculated in Fig. 3-1b as a function of soak duration. Three vehicle diurnals, of 4-, 5-, and 6-day durations, were brought about by Vehicle II on Monday, Tuesday and Wednesday, respectively. Three vehicle diurnals, of 1-, 2-, and 3-day durations, were brought about twice: first by Vehicle III on Wednesday, Thursday and Friday; and second by Vehicle II on Friday, Saturday and Sunday. Two vehicle diurnals of 1-day duration were brought about by Vehicle I and Vehicle III on Sunday.

As a result, the three vehicles experienced a total of 11 vehicle diurnals over the week, which consisted of four 1-day diurnals, two 2-day diurnals, two 3-day diurnals and one diurnal each of 4-, 5-, and 6-day durations (see Fig. 3-1b).

The method described above for the three example vehicles was applied to 903 vehicles for which daily vehicle uses over a one-week period had been obtained by the Household Survey.

Table 3-11 shows the distribution of vehicle diurnals over days of the week for the 903 surveyed vehicles. Among weekdays, Mondays have the largest number of vehicle diurnals (228) whereas Thursdays have the least (200). Saturdays and Sundays have greater numbers of vehicle diurnals than weekdays (273 and 284). On average, percentages of vehicles experiencing diurnals are about 23% on weekdays and 31% on weekend days.

TABLE 3-11. NUMBER OF VEHICLE DIURNALS ON DAYS OF THE WEEK FOR
TOTAL SURVEYED VEHICLES (n = 907).

<i>Duration</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Sun</i>	<i>Week Total</i>	<i>Percent</i>
1 Day	85	56	65	63	62	126	84	541	34%
2 Days	27	60	31	54	46	46	87	351	22%
3 Days	26	13	41	18	40	32	27	197	12%
4 Days	17	14	11	27	14	33	30	146	9%
5 Days	28	12	11	8	21	10	30	120	7%
6 Days	26	21	11	7	6	16	8	95	6%
7 Days	6	23	16	9	7	3	15	79	5%
8 Days	13	6	23	14	8	7	3	74	5%
Total diurnals	228	205	209	200	204	273	284	1603	100%
Percent*	25%	23%	23%	22%	23%	30%	31%	25%	

*Percent of possible vehicle diurnals

As to durations of vehicle diurnals, 1-day diurnals account for 34 percent of the total, followed by 2-day diurnals (22%) and 3-day diurnals (12%). Diurnals with longer durations have progressively smaller shares: 9% for 4-day diurnals, 7% for 5-day diurnals, 6% for 6-day diurnals, and 5% each for 7-day and 8-day diurnals. Although these results seem reasonable, there should presumably be additional diurnals with longer durations than 8 days.

Since the questionnaire asked about past vehicle uses only up to the seventh past day, it is not possible to determine diurnals with durations longer than 8 days from the present survey results. However, considering the asymptotic decrease in shares of longer duration diurnals, the numbers of vehicle diurnals determined above should represent a great majority of all diurnals -- perhaps 90 to 95 percent of them. Figure 3-2 shows cumulative distributions of vehicles on multi-day soak on weekdays and weekend days. The figure exhibits the asymptotic nature in both cumulative distributions.

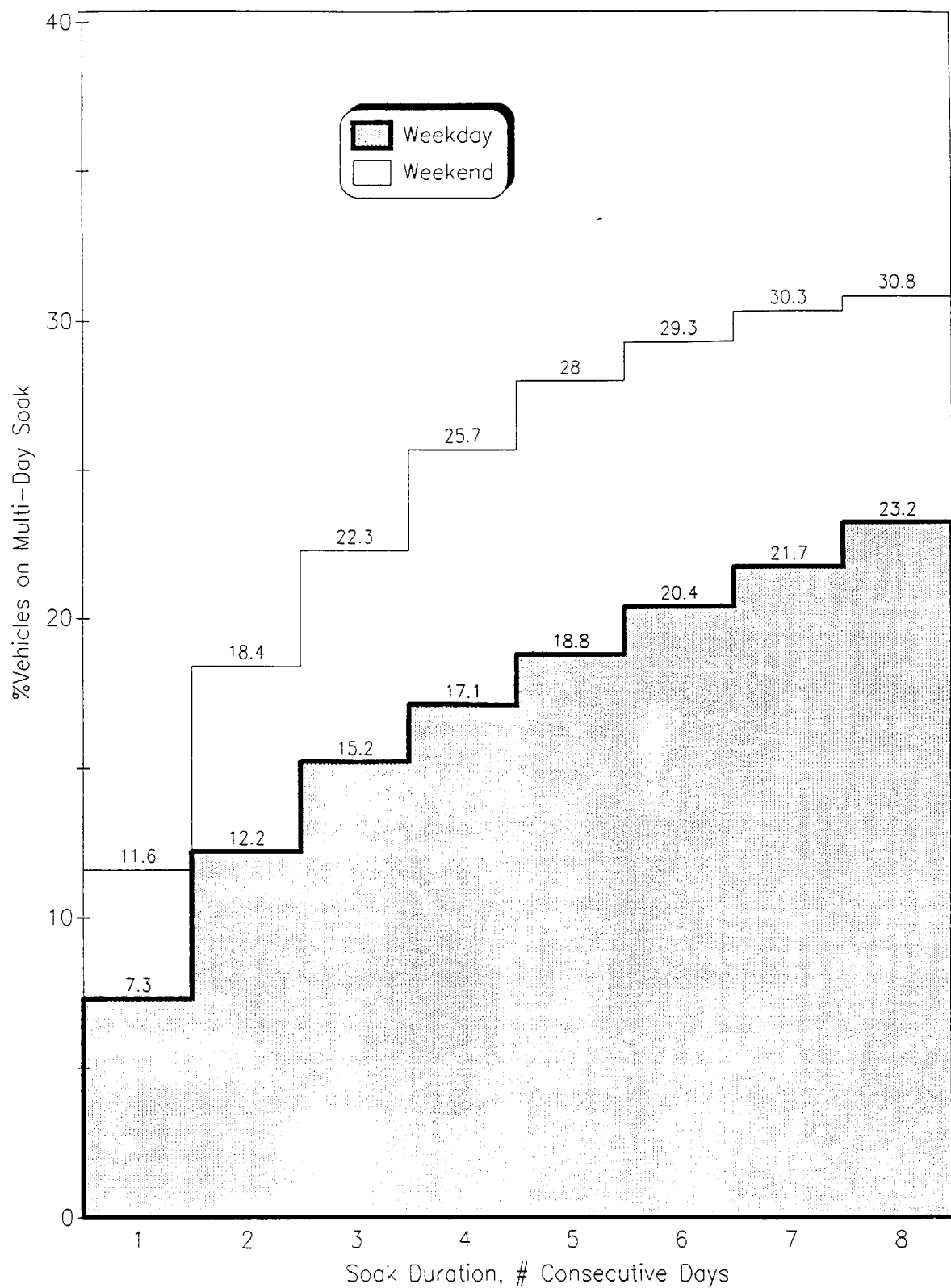


Figure 3-2. Cumulative Frequency Distributions of Privately-Owned Vehicles on Multi-Day Soak on Weekdays and Weekend Days

Table 3-12 shows distributions of vehicle diurnals on weekdays and weekends for six vehicle types found in the survey sample: auto, pickup, van, motorhome, motorcycle and truck. Percentages of vehicles in diurnals are greater on weekend days for all vehicle types except motorhomes, which have more vehicle diurnals on a weekday than on a weekend day (88% vs. 80%). Among the six vehicle types, motorcycles have the highest percentage of vehicles in diurnals (89%) and autos and vans have the lowest (24%).

TABLE 3-12. MEANS NUMBERS OF VEHICLE DIURNALS BY VEHICLE TYPE ON WEEKDAY AND WEEKEND.

<i>Vehicle Type</i>	<i># Vehicles</i>	<i># Vehicle Diurnals per Day</i>		
		<i>Weekday</i>	<i>Weekend</i>	<i>All day</i>
Auto	734	162.8 22%*	215.5 29%	177.9 24%
Pickup	107	26.6 25%	36.0 34%	29.3 27%
Van	47	9.8 21%	15.0 32%	11.3 24%
Motorhome	5	4.4 88%	4.0 80%	4.3 86%
Motorcycle	5	4.4 88%	4.5 90%	4.4 89%
Truck	5	1.2 24%	3.5 70%	1.9 37%
Total Vehicles	903	209.2	278.5	229.1
Percent*		23%	31%	25%

*Percent of possible vehicle diurnals.

3.2 DIARY SURVEY

We suspected that vehicle diurnals calculated from the questionnaire responses in Section 3.3.2.3 would be subject to inaccuracies associated with response errors. Since vehicle use data obtained from the household survey are solely interviewees' recollections of their past vehicle uses during a brief telephone interview period, it is quite conceivable that certain minor vehicle uses during the prior seven days have not been properly reflected on the questionnaire responses. In such cases, vehicle diurnals calculated from the questionnaire responses would tend to be overestimates because of the omission of certain vehicle uses from diurnal determinations.

To investigate the inaccuracy of diurnal determinations from questionnaire responses, a diary survey was conducted for a subset of the vehicles identified in the household survey. For all 452 interviewees who responded to the telephone questionnaire of the household survey, we inquired about their willingness to take vehicle use diaries for eight days in return for a modest cash incentive of ten dollars. Subsequently, to all 325 volunteers who expressed interest, we sent a specially designed postcard diary.

One hundred forty-three completed diaries were returned to VRC, with one erroneously recorded and one mailed back after all data encoding and analysis were completed. Thus, vehicle diurnals were computed for 141 vehicle use diaries. We asked each volunteer to take a diary only for one of his vehicles. If the volunteer had more than one vehicle, the diary was taken for a moderately used vehicle, which VRC selected from his vehicles after reviewing their use patterns.

Table 3-13 compares the vehicle type mix of the diary survey sample with that of the household survey sample. The two mixes are rather similar, except that the diary survey sample contains none of the minor vehicle types: motorhome, motorcycle and truck. Although the two samples are similar in vehicle mix, their storage patterns may be quite different. To evaluate this possibility in comparing the vehicle diurnals by the household survey with those by the diary survey, a subset of the questionnaire responses for the 141 vehicles included in the diary survey was extracted from the household survey sample.

TABLE 3-13. COMPARISON OF VEHICLE TYPE MIXES IN THE HOUSEHOLD SURVEY AND DIARY SURVEY SAMPLES.

<i>Vehicle Type</i>	<i>Household Survey</i>		<i>Diary Survey</i>	
	<i># Vehicles</i>	<i>Percent</i>	<i># Vehicles</i>	<i>Percent</i>
Auto	734	81.3	120	85.1
Pickup	107	11.8	15	10.6
Van	47	5.2	6	4.3
Motorhome	5	0.6	-	
Motorcycle	5	0.6	-	
Truck	5	0.6	-	
Total	903	100	141	100

Table 3-14a shows vehicle diurnals determined from the subset of the household survey sample whereas Table 3-14b shows those determined from the diary survey for the same set of 141 vehicles. In the subsets, the percentages of vehicles experiencing diurnals are estimated to be about 17 percent on weekdays and 29 percent on weekends, while in the diary survey, they are 16 percent and 26 percent respectively. The overall percentages for all days are 21 percent in the subset and 19 percent in the diary survey. Proportions of 1-, 2-, and 3-day vehicle diurnals to total vehicle diurnals are 54, 25 and 9 percent in the subset while in the diary survey, they are 60, 20, and 7 percent respectively.

TABLE 3-14A. NUMBER OF VEHICLE DIURNALS ON DAYS OF THE WEEK FOR SUBSET OF HOUSEHOLD-SURVEYED VEHICLES (n = 141)

<i>Duration</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Week Total</i>	<i>Percent</i>
1 Day	11	18	10	12	15	24	111	54%
2 Days	3	7	10	5	6	6	52	25%
3 Days	4	0	2	5	2	4	19	9%
4 Days	1	0	0	2	3	1	9	4%
5 Days	2	1	0	0	1	2	7	3%
6 Days	0	1	0	0	0	1	4	2%
7 Days	0	0	0	0	0	0	1	0%
8 Days	1	0	0	0	0	0	1	0%
Total Diurnals	22	27	22	24	27	38	204	100%
Percent*	16%	19%	16%	17%	19%	20%	31%	21%

*Percent of possible vehicle diurnals.

TABLE 3-14B. NUMBER OF VEHICLE DIURNALS ON DAYS OF THE WEEK FOR TOTAL DIARIED VEHICLES (n = 141)

<i>Duration</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Week Total</i>	<i>Percent</i>
1 Day	16	7	11	11	19	17	111	60%
2 Days	9	6	2	1	1	8	36	20%
3 Days	2	1	2	2	1	0	13	7%
4 Days	5	0	1	1	1	0	8	4%
5 Days	0	4	0	0	1	1	6	3%
6 Days	0	0	3	0	0	1	5	3%
7 Days	0	0	0	3	0	0	3	2%
8 Days	0	0	0	0	2	0	2	1%
Total Diurnals	32	18	19	18	25	27	184	100%
Percent*	23%	13%	13%	13%	18%	19%	32%	19%

*Percent of possible vehicle diurnals.

The good agreement in vehicle diurnals exhibited in the above comparison indicates that response errors in the household survey are not significant in determining vehicle diurnals. This lends assurance that the vehicle diurnals estimated from the sample of 903 vehicles in the household survey would indeed be a reasonable and accurate estimate that is subject only to random sampling errors. The magnitudes of sampling errors are estimated in Section 6 - Conclusions and Recommendations.

Tables 3-15A and 3-15B show, respectively, distribution of vehicle diurnals on weekdays and weekends for three vehicle types in the household survey subset and in the diary survey: autos, pickups, and vans. For all three vehicle types, the numbers of vehicle diurnals are greater on weekend days than on weekdays in both the subset and the diary survey. Furthermore, the percentages of vehicles in diurnals are about the same in the subset as in the diary survey for all three vehicle types. The only noticeable difference is found in pickups, for which the percentage of vehicles in diurnals for all days is 19% in the subset as compared to 9% in the diary survey.

TABLE 3-15A. MEAN NUMBERS OF VEHICLE DIURNALS BY VEHICLE TYPE ON WEEKDAY AND WEEKEND FOR SUBSET OF HOUSEHOLD-SURVEYED VEHICLES (n = 141)

<i>Vehicle Type</i>	<i># Vehicles</i>	<i># Vehicle Diurnals per Day</i>		
		<i>Weekday</i>	<i>Weekend</i>	<i>All day</i>
Auto	120	20.0 17%*	31.5 26%	23.3 19%
Pickup	15	1.6 11%	6.0 40%	2.9 19%
Van	6	2.4 40%	3.5 58%	2.7 45%
Total Vehicles	141	24.0	41.0	28.9
Percent*		17%	29%	20%

* Percent of the maximal possible vehicle diurnals.

**TABLE 3-15B. MEAN NUMBERS OF VEHICLE DIURNALS BY VEHICLE TYPE
ON WEEKDAY AND WEEKEND FOR DIARIED VEHICLES**

<i>Vehicle Type</i>	<i># Vehicles</i>	<i># Vehicle Diurnals per Day</i>		
		<i>Weekday</i>	<i>Weekend</i>	<i>All day</i>
Auto	120	19.8 17%*	29.0 24%	22.4 19%
Pickup	15	1.4 9%	1.5 10%	1.4 9%
Van	6	2.4 40%	4.5 75%	3.0 50%
Total Vehicles	141	23.6	35.0	26.8
Percent*		17%	25%	19%

* Percent of possible vehicle diurnals.

The overall percentages of all vehicles in diurnals on weekdays and weekend days are 17% and 29%, respectively, in the household survey subset as compared to 17% and 25% in the diary survey. These numbers are in excellent agreement, considering the fact that the two surveys were conducted nearly a month apart. Based on the comparisons made above, it was concluded that response errors in the household survey data were minimal as to determining vehicle diurnals.

4.0 BUSINESS VEHICLE SURVEY

4.1 VEHICLE POPULATION IN THE SoCAB

The purpose of this survey was to characterize storage patterns of "commercially-owned vehicles", i.e., gasoline-fueled vehicles owned and used by business establishments, public institutions and government agencies. Unfortunately, DMV vehicle registration records are not designed to differentiate vehicles by ownership type as envisioned in this study. Instead, DMV differentiates fee-paid vehicles and fee-exempt vehicles, and issues three types of licenses for vehicle types: auto, commercial, and motorcycle.

Among the DMV registration categories, all fee-exempt vehicles were considered to be commercially-owned vehicles. However, only a small part of the fee-paid vehicles would be commercially-owned. From general observation, practically all autos and motorcycles were considered not to be commercially-owned vehicles. Conversely, all full trucks including buses were considered to be commercially-owned vehicles. On the other hand, small trucks such as pickups, vans, station wagons, panel trucks, taxis, limousines, and ambulances may be either commercially-owned or privately-owned.

For small trucks, names of registered vehicle owners were examined for 4000 vehicles selected randomly from the special DMV data base (prepared for this study). As presented in Table 2-3 of Section 2.3, 468 small trucks were found to be owned by business enterprises. Therefore, 11.7 percent (468/4000) of fee-paid small trucks were estimated to be commercially-owned vehicles. Small trucks, in turn, account for 93.7 percent (1,407,300/1,501,500; see Table 2-3) of all fee-paid commercial-license vehicles. Using these proportions, the number of privately-owned vehicles with commercial licenses was estimated in Table 4-1A (from the DMV statistics for commercial-license vehicles) as:

$$1,543,000 \times 0.937 \times (1.0117) = 1,277,000$$

Conversely, the number of commercially-owned vehicles with commercial licenses was estimated in Table 4-1B as:

$$1,543,000 - 1,277,000 = 266,000$$

**TABLE 4-1A. ESTIMATED NUMBERS OF PRIVATELY-OWNED VEHICLES
IN THE SOCAB (Values in 1,000).**

<i>License Type</i>	<i>Fee-Paid Vehicles*</i>	<i>Privately-Owned Vehicles</i>
Auto	6,588	6,588
Commercial	1,543	1,277
Motorcycle	265	265
Total	8,396	8,130

*From DMV vehicle counts by county as of July 1987.

**TABLE 4-1B. ESTIMATED NUMBERS OF COMMERCIALY-OWNED VEHICLES
IN THE SOCAB (Values in 1,000).**

<i>License Type</i>	<i>DMV Registration Record*</i>		<i>Commercially-Owned Vehicles</i>	
	<i>Fee-Paid</i>	<i>Fee-Exempt</i>	<i>Fee-Paid</i>	<i>Fee-Exempt</i>
Auto	6,588	47	UNK**	47
Commercial	1,543	56	266	56
Small Truck***	-	-	169	-
Full Truck	-	-	97	-
Motorcycle	265	5	0	5
Total	8,396	108	266	108

* From DMV vehicle counts by county as of July 1987.

** There are an unknown number of commercially-owned, fee paid autos.

*** Include pickups, vans, station wagons, panel trucks, taxis, limousines, and ambulances.

As shown in Table 2-3, there are 94,100 full trucks among the 1,501,500 fee-paid, commercial-license vehicles listed in the special DMV data base. This total number of fee-paid, commercial-license vehicles is a little smaller than the DMV statistic of 1,543,000 vehicles. By adjusting for this difference, the number of full trucks is estimated in Table 4-1B as:

$$94,100 \times (1,543,000/1,501,500) = 97,000$$

The numbers of privately-owned and commercially-owned vehicles by license type are estimated* in Tables 4-1A and 4-1B according to the method described above. The tables show that in total, there are 374,000 commercially-owned vehicles in the SoCAB as compared to 8,130,000 privately-owned vehicles. This rather small population of commercially-owned vehicles is further divided into 266,000 fee-paid vehicles owned by business establishments and 108,000 fee-exempt vehicles owned by governmental agencies and public institutions.

A comparison of the numbers of fee-exempt vehicles in Tables 2-2 and 4-1b reveals that the number of fee-exempt vehicles included in the special DMV data base is only about half of that indicated in the DMV vehicle count summary of July 1987. This discrepancy is strange because the special data base was compiled by the DMV in May 1988, ten months after the date of the statistics. Nevertheless, vehicles included in the data base (and a random sample of them) were considered to be representative of the total population of fee-exempt vehicles in the SoCAB.

4.2 RESULTS OF BUSINESS VEHICLE SURVEY

The business vehicle survey was conducted for owners or users of a randomly drawn sample of 104 fee-exempt vehicles and 306 fee-paid commercial license vehicles. As shown in Table 4-2, these numbers of completed telephone interviews are in good agreement with the target numbers of completions: 100 for fee-exempt vehicles and 300 for fee-paid vehicles. Furthermore, the proportions of fee-exempt and fee-paid vehicles in the survey sample all

* The number of commercially-owned, fee-paid autos was not estimated for three reasons: (1) The number seems to be minuscule as compared to the number of privately-owned autos; (2) a great majority of such autos are likely to be used by small business owners and sales persons; and (3) their uses are expected to be similar to those of privately-owned autos.

happened to be about the same as those in the estimated numbers of fee-exempt and fee-paid commercially-owned vehicles in the SoCAB: 108,000 fee-exempt vehicles and 266,000 fee-paid vehicles (see Table 4-1B).

**TABLE 4-2. SUMMARY OF TELEPHONE INTERVIEW OUTCOMES
IN THE BUSINESS VEHICLE SURVEY.**

License and Vehicle Type	Target Numbers	# Completions*		# Failures*			Percent Complete
		Original	Substitute	D	R	N	
Fee-Exempt Vehicles							
1. Auto	47	43	9	8	0	0	86.7
2. Commercial	48	38	9	5	0	0	99.0
3. Motorcycle	5	3	2	1	0	0	83.3
Sub-Total	100	84	20	14	0	0	88.1
Fee-Paid Vehicles							
4. Small Truck***	200	153	46	43	15	9	74.3
5. Full Truck	100	97	10	21	11	8	72.8
Sub-Total	300	250	56	64	26	17	74.1
Grand Total	400	334	76	78	26	17	77.2

* Originally selected vehicles and substituted vehicles.

** D = Disconnected or wrong number.

R = Refusal

N = No longer own the vehicle and no similar vehicle.

*** Includes pickups, vans, station wagons, panel trucks, taxis, limousines and ambulances.

Since the basic sampling unit in the business vehicle survey was a single vehicle, a sample of vehicles was selected at random from the DMV-provided special data base. From the names and addresses of vehicle owners, a working survey list was constructed. The survey was targeted to the vehicles selected from the special data base. Because of this specificity as to the surveying vehicles, telephone interviewers diligently tracked down the right person to talk to through the often complex personnel maze in the organizations which own the target vehicles.

This survey method of using specified vehicles required substantially greater efforts on the part of list preparers and telephone interviewers than those of the household survey. However, the reward of the extra effort is a high completion rate of telephone interviews. Table 4-2 shows that the completion rate for fee-exempt vehicles is 88 percent while that for fee-paid vehicles is 77 percent. These completion rates are nearly twice that of the household survey (44%).

When the surveyed organization no longer owned the target vehicle, the survey was done on a substitute vehicle of the same type as the target vehicle. Such substituted vehicles account for about 20 percent of all completed interviews (see Table 4-2). Out of 531 attempted interviews, 121 attempts resulted in failures. The main cause of the failures was disconnected or wrong telephone numbers, accounting for two thirds of all failures. Flat refusals were only one fifth of the total failures.

Age distribution and storage patterns of the 410 surveyed commercially-owned vehicles are discussed in two subsections which follow.

4.2.1 DISTRIBUTIONS OF VEHICLE AGES AND OWNERS' BUSINESS TYPES

Table 4-3 shows age distribution for the 410 surveyed commercially-owned vehicles. The median ages are: 6 years for all vehicles and original vehicles, and 7 years for substitute vehicles. These median ages are 1 to 2 years older than found in the household survey sample. A noticeable difference in the two distributions is that the distribution of commercially-owned vehicles has a considerably smaller share of 1988 model year vehicles than that of privately-owned vehicles (3 percent versus 8 percent).

**TABLE 4-3. VEHICLE AGE DISTRIBUTION FOR 410 COMMERCIALLY-OWNED
VEHICLES IN THE BUSINESS VEHICLE SURVEY.**

<i>Model Year</i>	<i>Original Veh.</i>		<i>Substituted Veh.</i>		<i>All Vehicles</i>	
	<i># Vehicles</i>	<i>Percent</i>	<i># Vehicles</i>	<i>Percent</i>	<i># Vehicles</i>	<i>Percent</i>
1988	10	3.0	1	1.3	11	2.7
1987	31	9.3	4	5.3	35	8.5
1986	32	9.6	9	11.8	41	10.0
1985	37	11.1	8	10.5	45	11.0
1984	26	7.8	7	9.2	33	8.0
1983	17	5.1	2	2.6	19	4.6
1982	17	5.1	7	9.2	24	5.9
1981	21	6.3	1	1.3	22	5.4
1980	16	4.8	5	6.6	21	5.1
1975-79	59	17.7	19	25.0	78	19.0
1970-74	34	10.2	7	9.2	41	10.0
1965-69	16	4.8	0	0.0	16	3.9
1960-64	4	1.2	4	5.3	8	2.0
1960	14	4.2	2	2.6	16	3.9
<hr/>						
Total	334	100	76	100	410	100
Median Model Year	1982		1981		1982	
Median Age*	6 years		7 years		6 years	

*Assuming that latest model year vehicles are zero year old.

To examine the cause of the older median age of commercially-owned vehicles, median vehicle ages are calculated in Table 4-4 for the five licenses/vehicle types of vehicles in the business survey sample: autos, commercials, and motorcycles for fee-exempt vehicles; and small trucks and full trucks for fee-paid vehicles. The table shows that the median age of full trucks is nearly twice the median ages of other vehicle types: 10 years versus 3 to 6 years. Obviously, fee-paid full trucks caused the median age of commercially-owned vehicles to be older than that of privately-owned vehicles.

**TABLE 4-4. MEDIAN VEHICLE AGES OF VEHICLES IN FIVE
LICENSE AND VEHICLE TYPES.**

<i>License and Vehicle Type</i>	<i># Vehicles</i>	<i>Median Model Year</i>	<i>Median Vehicle Age</i>
Fee-Exempt Vehicles			
1. Auto	52	1984	4 years
2. Commercial	47	1982	6 years
3. Motorcycle	5	1985	3 years
Fee-Exempt Total	104	1984	4 years
Fee-Paid Vehicles			
4. Small Truck*	199	1983	5 years
5. Full Truck	107	1978	10 years
Fee-Paid Total	306	1981	7 years
Grand Total	410	1982	6 years

* Include pickups, vans, station wagons, panel trucks, taxis, limousines, and ambulances.

Table 4-5 shows the distribution of business types of the surveyed organizations owning target vehicles. The largest number of commercially-owned vehicles was found in "Services" (74), closely followed by "Construction" (71) and "Transportation and Public Utilities" (65). Among the ten divisions of Standard Industrial Classification (SIC), only "Mining" did not have any of the 410 surveyed vehicles. "Finance, Insurance and Real Estate" did have the smallest number of surveyed vehicles (3) among the remaining nine SIC divisions.

**TABLE 4-5. DISTRIBUTION OF COMMERCIALY-OWNED VEHICLES OVER MAJOR
STANDARD INDUSTRIAL CLASSIFICATION CATEGORIES**

<i>Basic Division</i>	<i>Major SIC (# Vehicles)</i>	<i># Vehicles</i>	<i>Percent</i>
A. Agriculture, Forestry, and Fishing	01 (3), 07 (18), 08 (1)	22	5.8
C. Construction	15 (35), 16 (9), 17 (27)	71	18.8
D. Manufacturing	20 (9), 24 (2), 25 (1), 26 (1), 27 (2), 28 (2), 29 (4), 30 (6), 33 (3), 34 (10), 35 (2), 37 (1)	43	11.3
E. Transportation and Public Utilities	41 (10), 42 (6), 44 (1), 45 (3), 47 (6), 48 (1), 49 (38)	65	17.2
F. Wholesale Trade	50 (12), 51 (8)	20	5.3
G. Retail Trade	52 (5), 54 (6), 55 (4), 56 (1), 57 (1), 58 (1), 59 (16)	34	9.0
H. Finance, Insurance, and Real Estate	60 (1), 61 (1), 65 (1)	3	0.8
I. Services	70 (1), 72 (5), 73 (14), 75 (29), 76 (2), 78 (2), 79 (1), 80 (3), 82 (15), 87 (2)	74	19.6
J. Public Administration	92 (41), 94 (2), 99 (3)	46	12.2
Sub-Total		378	100
Unknown SIC		32	
Grand Total		410	

4.2.2 STORAGE PATTERNS OF COMMERCIALY-OWNED VEHICLES

Since the total sample of 410 commercially-owned vehicles is not large, separate analyses of the storage patterns by each of the five vehicle types do not appear to be warranted for this study. Leaving such detailed analyses for those researches concerned with details of storage patterns by vehicle

type, this report discusses the overall storage pattern of commercially-owned vehicles in the survey sample.

Table 4-6A indicates that about 40 percent of commercially-owned vehicles are used every day while 60 percent of them are unused at least one day per week. The locations of extended storage over 24 hours are: outdoors exposed to the sun (74%), carport or shaded area (7%), and enclosed garage (19%). Table 4-6B shows that the fuel levels of tanks at the times of these extended storages are: about full (29%), about half full (58%), and nearly empty (13%).

TABLE 4-6A. RESPONSE SUMMARY AND STORAGE LOCATIONS OF VEHICLES DURING PAST 7 DAYS.

<i>Response Summary</i>		<i>Storage Summary</i>		
<i>Response</i>	<i># Vehicles</i>	<i>Storage Location</i>	<i># Vehicles</i>	<i>Percent</i>
Used everyday	152	Outdoors exposed	157	74.1
Unused at least a day	212	Shaded area	14	6.6
No answer	46	Enclosed garage	41	19.3
Grand Total	410	Total	212	100

TABLE 4-6B. FUEL LEVELS OF TANKS OF THOSE VEHICLES UNUSED AT LEAST ONE DAY DURING PAST 7 DAYS.

<i>How Full</i>	<i># Vehicles</i>	<i>Percent</i>
About full	62	28.7
About 1/2 full	126	58.3
Nearly empty	28	13.0
Total Response	216	100

Table 4-7A shows vehicle uses during last 24 hours. About two thirds of commercially-owned vehicles were used one to four times during last 24-hours. Vehicles totally unused during last 24 hours account for 18 percent while those used 5 times or more account for 17 percent. As to time of last previous vehicle use, two thirds of commercially-owned vehicles were being used at the time of telephone interviews, which, for a practical reason, were made on weekdays only. Of those vehicles unused during last 24 hours, 38 percent were unused for more than two weeks and 30 percent were unused for 1 to 2 weeks (see Table 4-7B).

TABLE 4-7A. SUMMARY OF VEHICLE USES DURING LAST 24-HOURS.

<i>Response Summary</i>			<i>Usage Summary</i>		
<i># Times Used During Last 24-Hrs.</i>			<i>Time of Last Vehicle Use</i>		
<i>Frequency</i>	<i># Vehicles</i>	<i>Percent</i>	<i>Time</i>	<i># Vehicles</i>	<i>Percent</i>
None	58	18.0	Being used now	222	66.1
Once	103	32.0	< 3 hours ago	22	6.5
2-4 times	108	33.5	< 12 hours ago	20	5.9
5 times or more	53	16.5	< 24 hours ago	14	4.2
			24 hours or more	58	17.3
Total response	322	100	Total response	336	100
No response	88		No Answer	74	
Grand Total	410		Grand Total	410	

TABLE 4-7B. NUMBER OF DAYS UNUSED FOR THOSE VEHICLES UNUSED DURING LAST 24-HOURS.

<i>Duration</i>	<i># Vehicles</i>	<i>Percent</i>
One day	2	4.0
Two days	4	8.0
3-6 days	10	20.0
1-2 weeks	15	30.0
> 2 weeks	19	38.0
Total response	50	100
No Answer	8	
Grand Total	58	

Table 4-8 shows last overnight storage at auto repair facilities. About two thirds of commercially-owned vehicles had ever been left overnight at auto repair facilities. Of them, nearly a third had been left overnight at such facilities less than a month ago. Only 3 percent of them were at such facilities at the time of interviews. Storage durations at auto repair facilities were mostly less than 48 hours (81%).

TABLE 4-8A. LAST OVERNIGHT STORAGE AT AUTO REPAIR FACILITIES

<i>Response Summary</i>		<i>Storage Summary</i>		
<i>Storage Status</i>	<i># Vehicles</i>	<i>Time of Last Repair</i>	<i># Vehicles</i>	<i>Percent</i>
Never left overnight	123	Right now	7	3.4
Ever left overnight	207	1-week ago	12	5.8
Total response	330	1-month ago	41	19.8
No answer	80	1-6 months ago	109	52.7
		6 months ago	38	18.4
Grand Total	410	Total	207	100

TABLE 4-8B. STORAGE DURATION AT AUTO REPAIR FACILITIES

<i>Storage Duration</i>	<i># Vehicles</i>	<i>Percent</i>
< 24 hours	101	48.8
24-48 hours	66	31.9
3-6 days	22	10.6
1-2 weeks	14	6.8
> 2 weeks	4	1.9
Total response	207	100
No answer	0	
Grand total	207	

Tables 4-9 and 4-10 show overnight storages at parking lots and recreational places. As anticipated, not many commercially-owned vehicles had ever been stored overnight at these facilities; only 7 percent of commercially-owned vehicles had ever been stored overnight at parking lots or at recreational places. Furthermore, a majority of those ever stored overnight at such places had been so more than a month earlier.

TABLE 4-9A. LAST OVERNIGHT STORAGE AT PARKING LOTS

<i>Response Summary</i>		<i>Storage Summary</i>		
<i>Storage Status</i>	<i># Vehicles</i>	<i>Time of Last Parking</i>	<i># Vehicles</i>	<i>Percent</i>
Never left overnight	320	Right now	3	12.0
Ever left overnight	25	1-week ago	0	0.0
Total response	345	1-month ago	4	16.0
No answer	65	1-6 months ago	6	24.0
		6 months ago	12	48.0
Grand Total	410	Total	25	100

TABLE 4-9B. STORAGE DURATION AT PARKING LOTS

<i>Storage Duration</i>	<i># Vehicles</i>	<i>Percent</i>
< 24 hours	10	40.0
24-48 hours	13	52.0
3-6 days	2	8.0
1-2 weeks	0	0.0
> 2 weeks	0	0.0
Total response	25	100
No answer	0	
Grand total	25	

TABLE 4-10A. LAST OVERNIGHT STORAGE AT RECREATIONAL PLACES

<i>Response Summary</i>		<i>Location</i>	<i>Storage Summary</i>	
<i>Storage Status</i>	<i># Vehicles</i>		<i># Vehicles</i>	<i>Percent</i>
Never left overnight	324	Campground or Park	7	30.4
Ever left overnight	23	Beach or Wilderness	15	65.2
Total response	347	Hotel or Motel	0	0.0
No answer	63	Ski resort	1	4.3
Grand Total	410	Total	23	100

TABLE 4-10B. STORAGE DURATION AT RECREATIONAL PLACES

<i>Storage Duration</i>	<i># Vehicles</i>	<i>Percent</i>
Right now	3	13.0
< 1 week ago	0	0.0
< 1 month ago	2	8.7
1-6 months ago	10	43.5
> 6 months ago	8	34.8
Total response	23	100
No answer	0	
Grand total	23	

4.2.3 MULTI-DAY STORAGE FREQUENCY OF COMMERCIALY-OWNED VEHICLES

Multi-day soaking events for commercially-owned vehicles were quantified from their questionnaire responses in the same manner as those for privately-owned vehicles. Table 4-11 summarizes such multi-day soaking events in terms of the number of diurnals with varying durations: 1-day diurnals

to 8-day diurnals. Of the 410 surveyed vehicles, 367 vehicles had sufficient data to determine diurnals during past 7 days.

**TABLE 4-11. NUMBER OF VEHICLE DIURNALS ON DAYS OF THE WEEK
FOR COMMERCIALY-OWNED VEHICLES (N = 367)**

<i>Duration</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Sun</i>	<i>Week Total</i>	<i>Percent</i>
1 Day	21	24	18	24	30	199	26	342	36%
2 Days	5	16	16	11	19	12	197	276	29%
3 Days	7	2	14	14	8	20	16	81	9%
4 Days	12	5	1	14	12	6	16	66	7%
5 Days	11	8	3	0	13	12	6	53	6%
6 Days	5	7	6	1	0	13	12	44	5%
7 Days	12	5	7	5	1	0	13	43	4%
8 Days	13	11	3	6	4	0	0	37	4%
Total Diurnals	86	78	68	75	87	262	286	942	100%
Percent*	23%	21%	19%	20%	24%	71%	78%	37%	

*Percent of possible vehicle diurnals.

Percentages of commercially-owned vehicles experiencing diurnals on weekdays are 19% on Wednesdays to 24% on Fridays. These percentages are about the same as those of privately-owned vehicles. However, percentage of vehicles in diurnals on weekends rises to over 70 percent which is considerably higher than that of privately-owned vehicles (28%). This high proportion of vehicles in diurnals on weekends is the most striking difference in storage pattern between commercially-owned and privately-owned vehicles.

As to distribution of vehicle diurnals over different durations, two distributions for commercially-owned and privately-owned vehicles are nearly identical (see Tables 3-11 and 4-11), indicating stability of estimated vehicle diurnals from questionnaire responses. As a result of the higher proportion of vehicles with diurnals on weekends, the overall proportion of vehicles with diurnals on an average day is also higher for commercially-owned vehicles than for privately-owned vehicles: 37 percent versus 23 percent.

Figure 4-1 shows cumulative frequency distributions of commercially-owned vehicles on multi-day soak on weekdays and weekend days. It clearly shows that a majority of commercially-owned vehicles are not used on weekends, and that those on multi-day soak are mostly of 1- and 2-day diurnals.

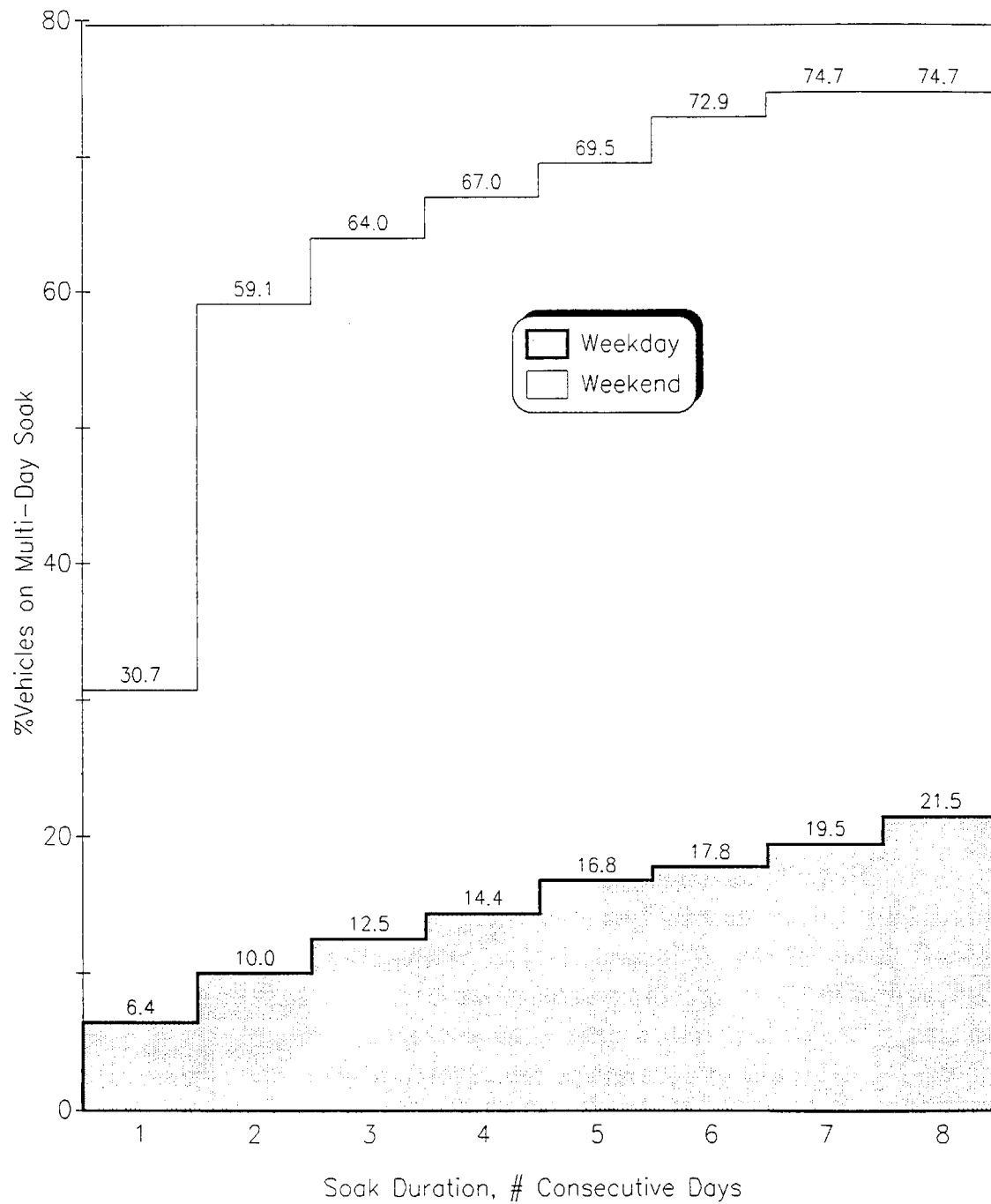


Figure 4-1. Cumulative Frequency Distributions of Comercially-Owned Vehicles on Multi-Day Soak on Weekdays and Weekend Days

5.0 FACILITY SURVEY

5.1 PURPOSE OF THE SURVEY

The purpose of facility surveys is somewhat different from those of the two surveys discussed in earlier sections. For the household and business vehicle surveys, the primary purpose was to quantify vehicle non-uses (as exemplified by "vehicle diurnals") of the two mutually exclusive portions of the total vehicle population: privately-owned vehicles and commercially-owned vehicles. The purpose of the facility survey (a collection of 5 surveys), on the other hand, is to provide spatial information on vehicle non-uses by estimating vehicle diurnals at selected types of facilities where many vehicles are expected to be stored temporarily.

The following five types of facilities were selected for this survey:

1. New and Used Vehicle Dealers
2. Vehicle Rental and Leasing Agents
3. Auto Repair and Body Shops
4. Scrap and Dismantling Yards
5. Parking and Campground Areas

As discussed in the Survey Design (see Section 2.4), we identified several relevant standard industrial classification (SIC) codes for each of the five business lines and purchased a sufficient number of business lists from Dun's Marketing Services, a company of the Dun & Bradstreet Corporation. Five separate surveys were conducted to characterize vehicle storage patterns at the five types of facilities.

5.2 RESULTS OF FACILITY SURVEYS

The facility survey was executed in the same manner as the two earlier surveys; specially designed questionnaires were administered to owners or managers of selected facilities by professional telephone interviewers. The questionnaires used for the five facility types are presented in Appendices D through H. Results of telephone interviews are summarized in Table 5-1A.

To meet the target number of 300 completed interviews, a total of 381 interview attempts were made, resulting in 317 successful interviews and 64 unsuccessful interviews. The major cause of unsuccessful interviews was disconnected or wrong telephone numbers which had been provided by Dun's Marketing Services (DMS). There were 52 such telephone numbers out of 381. This 14 percent ($= 52/381$) defect rate is a little higher than the 8 percent overall defect rate acknowledged by DMS for its business list. However, considering that the list's defect rate increases as business size becomes smaller, the observed defect rate seems to be reasonable because of generally small businesses in the five business areas. There were only ten flat refusals in the whole 381 interview attempts.

Since the survey objective was to characterize vehicle storage patterns at all subject facilities, telephone interviews were judged to be successful (regardless of presence or absence of motor vehicles at the interviewed facilities) as long as the interviews covered all relevant questions with interviewees. Indeed, presence or absence of vehicles at subject facilities is an important piece of information for estimating the total number of vehicles experiencing multi-day soaking in the SoCAB.

Proportions of facilities having no vehicles are found (see Table 5-1A) to be very high for scrap and dismantling yards (88%) and moderately high for new and used vehicle dealers (28%) and vehicle rental and leasing agencies (31%). Such proportions are very low for auto repair and body shops (1%) and parking and campground areas (0%).

Completion rates of the telephone interviews were quite high for all five facility types, ranging from 74 percent for vehicle dealers to 89 percent for parking and campgrounds. The overall completion rate was 83 percent.

In this survey, facilities were selected based not only on their primary SIC's but also on their secondary (i.e., second place) SIC's. Therefore, a facility that provides new car sales and auto repair services would be selected twice: first for new and used vehicle dealers and second for auto repair and body shops. The numbers of facilities in five business areas because of their primary or secondary SIC's are listed in Table 5-1B.

**TABLE 5-1A. SUMMARY OF TELEPHONE INTERVIEW OUTCOMES
IN THE FACILITY SURVEY.**

<i>Facility Type*</i>	<i>Target Numbers</i>	<i># Attempted Interviews</i>	<i># Completions</i>		<i># Failures**</i>			<i>Percent Complete</i>
			<i>W/Car</i>	<i>W/O Car</i>	<i>DC</i>	<i>NA</i>	<i>R</i>	
1	50	68	36	14	16	0	2	74
2	40	68	38	17	8	1	4	81
3	130	150	131	1	15	1	2	88
4	40	50	5	35	9	0	1	80
5	40	45	40	0	4	0	1	89
Total	300	381	250	67	52	2	10	83

- *1. New and Used Vehicle Dealers
- 2. Vehicle Rental and Lease Agents
- 3. Auto Repair and Body Shops
- 4. Scrap and Dismantling Yards
- 5. Parking and Campground Areas

**DC = Disconnected, NA = No Answer, R = Refusal

**TABLE 5-1B. NUMBERS OF FACILITIES AND COMPLETIONS
BY PRIMARY AND SECONDARY SIC'S.**

<i>Facility Type</i>	<i># Facilities in SoCAB</i>			<i># Completions with Cars</i>		
	<i>Primary</i>	<i>Secondary*</i>	<i>% Primary</i>	<i>Primary</i>	<i>Secondary*</i>	<i>% Primary</i>
1.	2,284	339	87	36	0	100
2.	1,066	234	82	33	5	87
3.	11,645	1,788	87	112	20	85
4.	2,201	1,007	69	3	2	60
5.	377	90	81	32	8	80
Total	17,573	3,458	84	216	35	86

*Include the second through seventh place SIC's at each facility.

According to the Dun's business name data base, the total numbers of facilities engaged in the five business areas in the SoCAB were 17,600 for primary SIC's and 3,500 for secondary SIC's (as of July 1988). From these two numbers, the proportion of primary SIC facilities (i.e., facilities counted because of their primary SIC's) among all facilities in the five

business areas is estimated to be 84 percent, leaving 16 percent for secondary SIC facilities. In the same table, numbers of completed interviews of facilities with motor vehicles are also given. The proportion of primary SIC facilities in the survey sample happens to be nearly the same as that in the Dun's data base: 86 percent versus 84 percent.

This coincidental good agreement is very fortunate for interpreting survey results; results of the survey will be applicable for vehicle storage patterns at both primary and secondary SIC facilities.

5.3 STORAGE PATTERNS OF VEHICLES AT FACILITIES

Vehicle storage patterns delineated from results of the facility survey are described for each of the five facility types examined. Merging the storage pattern data with the facility populations in the SoCAB, basinwide estimates of vehicle diurnals are obtained for all five facility types.

5.3.1 NEW AND USED VEHICLE DEALERS

New car dealers keep many new pre-registered vehicles and some used vehicles at their sales lots and preparation lots for extended periods before these vehicles are sold. Similarly, used car dealers keep many used vehicles at their sales lots and other places for extended periods. Since all these vehicles contain small amounts of fuel in their tanks, they may constitute a significant source of multi-day vehicle soaking.

Table 5-2 shows the distribution of the 36 surveyed vehicle dealers with vehicles with respect to the numbers of employees at the facility location and in the entire company. About a third of the facilities have fewer than 10 employees; two thirds have ten or more employees. The average number of employees is 49 at a facility location and 55 for an entire company.

TABLE 5-2. NUMBERS OF EMPLOYEES AT FACILITY LOCATION AND IN ENTIRE COMPANY FOR AUTO DEALERS (n = 36).

# Employees	Number of Facilities	
	At Location	Entire Company
1	0	0
2-4	9	9
5-9	2	0
10-19	6	7
20-49	3	3
50-99	8	8
100-199	7	7
≥ 200	0	4
Total # Facilities	35	34
No Answer	1	2
Total # Employees	1,710	1,856
Avg. # Employees	48.9	54.6

Table 5-3 shows the distribution of the new vehicle dealers with respect to the numbers of vehicles kept at their facilities and those driven out on the days preceding the telephone interviews. Of the 36 vehicle dealers surveyed, 26 sold both new and used vehicles, 1 sold new vehicles only, and 9 sold used vehicles only. Therefore, there were 27 facilities selling new vehicles and 35 facilities selling used vehicles.

Table 5-3a shows that a great majority of vehicles at new car sales facilities are autos (63%), followed by light duty trucks (LDT, 17%), motorcycles (MC, 14%), medium duty vehicles (MDV, 4%), and heavy duty trucks (HDT, 2%). Average numbers of vehicles per facility are 98 for autos, 27 for LDT, 7 for MDV, 3 for HDT, and 22 for MC. The definitions of these vehicle types are described below:

Autos (e.g., passenger cars, taxis, and mini-vans) are all passenger vehicles of less than 6,000 pounds in gross vehicle weight (GVW).

Light Duty Trucks (e.g., small pick-ups and vans) are those trucks weighing less than 6,000 pounds GVW.

Medium Duty Vehicles (e.g., large pick-ups and vans, campers, and limousines) are those vehicles weighing 6,000 to 8,500 pounds GVW.

Heavy Duty Trucks (e.g., motor homes, trucks, buses, and tractors) are those trucks weighing more than 8,500 pounds GVW.

Motorcycles (e.g., motorcycles, mopeds, ATVs, and scooters) are two or three wheeled vehicles with an engine of 50 cubic centimeters (cc) or more.

Table 5-3b shows the distribution by type of vehicles which were driven out on days immediately preceding the interviews. The distribution is similar to the one in Table 5-3a, but the numbers of such vehicles are considerably smaller than those in the other table. Average numbers of vehicles driven out are 7 vehicles per facility for auto, 1.5 for LDT, none for MDV, 0.1 for HDT, and 0.6 for MC.

TABLE 5-3A. NUMBER OF NEW VEHICLES AT NEW VEHICLE DEALERS (n = 27)

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	3	0	0	0	0
6-10	0	1	2	1	0
11-50	5	5	3	3	3
51-100	9	3	1	0	2
> 100	9	2	0	0	1
Total # Facilities	26	11	6	4	6
NA*	1	16	21	23	21
Total # Vehicles	2,652	735	180	77	580
Avg. # Vehicles**	98.2	27.2	6.7	2.9	21.5

TABLE 5-3B. NUMBER OF NEW VEHICLES DRIVEN ON PREVIOUS DAY OUT OF NEW VEHICLE DEALERS (n = 27).

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	5	4	1	2	1
6-10	8	4	0	0	0
11-50	5	0	0	0	1
51-100	0	0	0	0	0
> 100	0	0	0	0	0
Total # Facilities	18	8	1	2	2
NA*	9	19	26	25	25
Total # Vehicles	188	41	1	2	17
Avg. # Vehicles**	7.0	1.5	0.0	0.1	0.6

* Not applicable or no answer.

** Averaged over all sampled facilities, i.e., n = 27.

Table 5-4A shows lengths of stay of new vehicles at lots before being sold and Table 5-4B shows inventory levels in the preceding months, June through September. (The facility survey was carried out in December 1988 through February 1989.) The stay of these vehicles at lots ranges from 6 - 10 days to over 30 days, with more vehicles in the longer category. The inventory levels in June through September seemed to be about the same as those at the time of the facility survey for most surveyed facilities.

TABLE 5-4A. NUMBER OF DAYS REMAINING AT LOTS BEFORE BEING SOLD OR MOVED ELSEWHERE FOR NEW VEHICLES

<i>Length of Stay</i>	<i>Auto</i>	<i>Number of Facilities</i>			
		<i>LDT</i>	<i>MDV</i>	<i>HDT</i>	<i>MC</i>
1 Day	0	0	0	0	0
2 Days	0	0	0	0	0
3-5 Days	0	0	0	0	0
6-10 Days	1	0	0	0	0
11-30 Days	10	4	5	3	1
> 30 Days	15	6	1	2	5
Total # Facilities	26	10	6	5	6
Median # Days	> 30	> 30	11-30	11-30	> 30

TABLE 5-4B. RELATIVE INVENTORY LEVELS IN JUNE THROUGH SEPTEMBER AS COMPARED TO THE LEVEL AT INTERVIEW FOR NEW VEHICLES.

<i>Inventory Level</i>	<i>June</i>	<i>Number of Facilities</i>		
		<i>July</i>	<i>August</i>	<i>September</i>
Considerably higher	2	2	2	1
Somewhat higher	3	3	4	3
About the same	13	14	13	13
Somewhat lower	8	7	7	9
Considerably lower	1	1	1	1
Total # Facilities	27	27	27	27

Tables 5-5A, 5-5B, 5-6A, and 5-6B show similar summary results for used vehicles at new and used vehicle sales facilities. Average numbers of used vehicles at these facilities are 39 for auto, 5 for LDT, 1 for MDV, 0.6 for HDT and 2 for MC. Numbers of vehicles driven out on days immediately preceding the interviews are generally about a quarter of those at the facilities: 9 vehicles per facility for auto, 0.8 for LDT, 0.2 for MDV, none for HDT, and 0.1 for MC. The number of days remaining at lots before being sold is about the same for used vehicles as for new vehicles: from 6-10 days to over 30

days, with most of them in the longer category. The inventory levels in the preceding June through September were in general about the same as those at the interviews.

TABLE 5-5A. NUMBER OF USED VEHICLES AT NEW AND USED VEHICLE DEALERS (n = 35)

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	2	6	3	1	3
6-10	1	2	1	0	1
11-50	17	5	1	1	1
50-100	6	0	0	0	0
> 100	2	0	0	0	0
Total # Facilities	28	13	5	2	5
NA*	7	22	30	33	30
Total # Vehicles	1,367	176	36	21	58
Avg. # Vehicles**	39.1	5.0	1.0	0.6	1.7

* Not applicable or no answers.

** Averaged over all sampled facilities, i.e., n = 35.

TABLE 5-5B. NUMBER OF USED VEHICLES DRIVEN ON PREVIOUS DAY OUT OF NEW AND USED VEHICLE DEALERS (n = 35).

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	12	8	3	0	1
6-10	4	0	0	0	0
11-50	2	1	0	0	0
51-100	0	0	0	0	0
> 100	1	0	0	0	0
Total # Facilities	19	9	3	0	1
NA*	16	26	32	35	34
Total # Vehicles	304	27	6	0	2
Avg. # Vehicles**	8.7	0.8	0.2	0.0	0.1

* Not applicable or no answers.

** Averaged over all sampled facilities, i.e., n = 35.

TABLE 5-6A. NUMBER OF DAYS REMAINING AT LOTS BEFORE BEING SOLD OR MOVED ELSEWHERE FOR USED VEHICLES.

<i>Length of Stay</i>	<i>Number of Facilities</i>				
	<i>Auto</i>	<i>LDT</i>	<i>MDV</i>	<i>HDT</i>	<i>MC</i>
1 Day	0	0	0	0	0
2 Days	0	0	0	0	0
3-5 Days	1	0	0	0	0
6-10 Days	2	2	2	1	0
11-30 Days	11	3	2	0	2
Over 30 Days	15	7	1	1	3
Total # Facilities	29	12	5	2	5
Median # Days	> 30	> 30	11-30	11-30	> 30

TABLE 5-6B. RELATIVE INVENTORY LEVELS IN JUNE THROUGH SEPTEMBER AS COMPARED TO THAT AT THE TIME OF INTERVIEW

<i>Inventory Level</i>	<i>Number of Facilities</i>			
	<i>June</i>	<i>July</i>	<i>August</i>	<i>September</i>
Considerably higher	2	2	2	2
Somewhat higher	7	7	6	6
About the same	20	19	20	21
Somewhat lower	5	5	5	5
Considerably lower	1	2	2	1
Total # Facilities	35	35	35	35

Based on the survey results described above, quantitative rates of vehicle non-uses at new and used vehicle sales facilities were estimated. Table 5-7 shows estimated numbers of new and used vehicles experiencing multi-day soaking at vehicle sales lots in the SoCAB. The number of facilities with cars was first estimated based on the proportion of facilities with vehicles in all surveyed facilities. Second, the average number of vehicles unused on days immediately preceding the interviews was estimated from the difference between total vehicles at a facility and those driven out on the preceding day. Finally, the number of vehicles experiencing multi-day soaking in the SoCAB was computed by taking the product of the number of facilities with vehicles and the average number of vehicles unused at the facility.

TABLE 5-7. ESTIMATED NUMBERS OF NEW AND USED VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING AT VEHICLE SALES LOTS IN THE SoCAB.

# Vehicle Sales Facilities with Cars	$2623 \times (36/68)$	=	1390
# New Vehicle Sales Facilities	$1390 \times (27/36)$	=	1043
# Used Vehicle Sales Facilities	$1390 \times (35/36)$	=	1351
NEW VEHICLES			
Auto	$1043 \times (98.2 - 7.0)$	=	95,122
LDT	$1043 \times (27.2 - 1.5)$	=	26,805
MDV	$1043 \times (6.7 - 0.0)$	=	6,988
HDT	$1043 \times (2.9 - 0.1)$	=	2,920
MC	$1043 \times (21.5 - 0.6)$	=	21,799
Total # New Vehicles in Diurnals			153,634
USED VEHICLES			
Auto	$1351 \times (39.1 - 8.7)$	=	41,070
LDT	$1351 \times (5.0 - 0.8)$	=	5,674
MDV	$1351 \times (1.0 - 0.2)$	=	1,081
HDT	$1351 \times (0.6 - 0.0)$	=	811
MC	$1351 \times (1.7 - 0.1)$	=	2,162
Total # Used Vehicles in Diurnals			50,798
Grand Total			204,432

The table shows that new pre-registered vehicles at new vehicle sales lots generate 154,000 vehicle diurnals in the SoCAB, while used vehicles at new and used vehicle sales lots generate 51,000 vehicle diurnals. These figures should be compared with the numbers of vehicle diurnals for privately-owned and commercially-owned vehicles which are estimated below:

Privately-Owned Vehicles

Household Survey: $8,130,000 \times 0.23 = 1,870,000$

Diary Survey: $8,130,000 \times 0.19 = 1,545,000$

Commercially-Owned Vehicles

$374,000 \times 0.37 = 138,000$

Therefore, vehicle diurnals at vehicle sales lots are estimated to be in the same order of magnitude as those of commercially-owned vehicles and an order of magnitude smaller than those of privately-owned vehicles.

5.3.2 VEHICLE RENTAL AND LEASE AGENTS

A total of 38 facilities with vehicles and 17 facilities without vehicles were successfully surveyed to characterize vehicle storage patterns at vehicle rental and lease agents. The employment sizes of those facilities with vehicles are summarized in Table 5-8. On average, 13 people were employed at each facility location and 52 people in each entire company.

TABLE 5-8. NUMBER OF EMPLOYEES AT FACILITY LOCATION AND IN ENTIRE COMPANY FOR VEHICLE RENTAL AND LEASE (n = 38).

# Employees	<i>Number of Facilities</i>	
	<i>At Location</i>	<i>Entire Company</i>
1	2	2
2-4	14	11
5-9	5	1
10-19	10	0
20-49	5	4
50-99	1	1
100-199	1	2
≥ 200	0	2
Total # Facilities	38	23
No Answer	0	15
Total # Employees	509	1,191
Avg. # Employees	13.4	51.8

The average numbers of vehicles at rental and lease agents are 17 for auto, 8 for LDT, 7 for MDV, 19 for HDV, and none for MC (see Table 5-9A). Table 5-9A also indicates that more facilities have HDTs than any of the other types of vehicles. Therefore, the survey sample seems to have been loaded heavily with large-truck leasing agents. Although it seems contrary to our expectation, there may indeed be many truck leasing facilities in the SoCAB.

Table 5-9B shows the numbers of vehicles driven out of surveyed facilities on days immediately preceding the interviews. The average numbers of such vehicles per facility are 6 for auto, 1 for LDT, 1 for MDV, 2 for HDT, and none for MC. These numbers are considerably smaller than those of vehicles found at rental and leasing agencies (see Table 5-9A), implying that most vehicles at these places may be unused for several days.

TABLE 5-9A. NUMBER OF VEHICLES AT VEHICLE RENTAL AND LEASING PLACES (n = 38)

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	5	5	7	7	0
6-10	5	5	5	6	0
11-50	5	9	6	16	0
51-100	2	0	1	0	0
> 100	2	0	0	1	0
Total # Facilities	19	19	19	30	0
NA*	19	19	19	8	38
Total # Vehicles	655	315	280	709	0
Avg # Vehicles**	17.2	8.3	7.4	18.7	0.0

* Not applicable or no answer.

** Averaged over all surveyed facilities, i.e., n = 38.

TABLE 5-9B. NUMBER OF VEHICLES DRIVEN YESTERDAY OUT OF VEHICLE RENTAL AND LEASING PLACES (n = 38).

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HT	MC
1-5	3	3	9	8	0
6-10	2	1	2	5	0
11-50	5	2	0	1	0
51-100	0	0	0	0	0
>100	1	0	0	0	0
Total # Facilities	11	6	11	14	0
NA*	27	32	27	24	38
Total # Vehicles	238	46	46	80	0
Avg. # Vehicles**	6.3	1.2	1.2	2.1	0.0

* Not applicable or no answer.

** Averaged over all surveyed facilities, i.e., n = 38.

Table 5-10A shows how long these vehicles remain at lots before being rented. It indicates that most of these vehicles remain unused for 1 to 5 days. Table 5-10B shows the relative inventory levels of these vehicles in June through September as compared to that at the time of the interview. Although there is considerable scatter in such relative levels, the inventory levels in those months are, on average, the same as those at the interview time.

TABLE 5-10A. NUMBER OF DAYS REMAINED AT LOTS BEFORE BEING RENTED OR MOVED ELSEWHERE FOR VEHICLE RENTAL AND LEASING PLACES.

<i>Duration</i>	<i>Number of Facilities</i>				
	<i>Auto</i>	<i>LDT</i>	<i>MDV</i>	<i>HDT</i>	<i>MC</i>
1 Day	5	4	5	9	0
2 Days	11	9	7	5	0
3-5 Days	3	5	3	13	0
6-10 Days	0	0	3	0	0
11-30 Days	0	2	2	2	0
> 30 Days	0	0	0	1	0
Total # Facilities	19	20	20	30	0
Median # Days	2	2	2	3-5	-

TABLE 5-10B. RELATIVE INVENTORY LEVELS IN JUNE THROUGH SEPTEMBER AS COMPARED TO THE LEVEL AT INTERVIEW

<i>Inventory Level</i>	<i>Number of Facilities</i>			
	<i>June</i>	<i>July</i>	<i>August</i>	<i>September</i>
Considerably higher	4	5	5	3
Somewhat higher	7	5	5	6
About the same	9	12	12	12
Somewhat lower	3	2	3	4
Considerably lower	7	6	5	5
Total # Facilities	30	30	30	30

Table 5-11 provides the estimated number of vehicles experiencing multi-day soaking at vehicle rental and leasing places in the SoCAB. Among the five vehicle types, HDT exhibits the largest number of vehicle diurnals whereas MC shows no diurnal at such places. In total, there are 22,000 vehicle diurnals at vehicle rental and leasing places in the SoCAB.

TABLE 5-11. ESTIMATED NUMBER OF VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING AT VEHICLE RENTAL AND LEASING PLACES IN THE SoCAB.

# Vehicle Rental and Leasing Facilities with Cars				$1300 \times (38/68) =$	726
Auto	$726 \times (17.2 - 10.9)$	=		4,574	
LDT	$726 \times (8.3 - 3.8)$	=		3,267	
MDV	$726 \times (7.4 - 2.1)$	=		3,848	
HDT	$726 \times (18.7 - 4.5)$	=		10,309	
MC	$726 \times (0.0 - 0.0)$	=		0	
Total # Vehicles in Diurnals					21,998

5.3.3 AUTO REPAIR AND BODY SHOPS

There are many motor vehicles left overnight for repair or body work at auto repair and body shops. Although these vehicles belong to customers rather than shop owners, they may cause a significant shift in the spatial distribution of multi-day vehicle soaking. Similar situations are expected for those vehicles at impound yards, parking lots and campgrounds.

Since there are so many auto repair and body shops (see Table 5-1b), the largest number of target samples were allocated to this SIC group. In all, 131 facilities with vehicles were successfully interviewed. Table 5-12 shows the numbers of employees and mechanics at these surveyed facilities. As expected, most of the auto repair and body shops are small facilities having less than ten employees. On average, these facilities have 3 mechanics per facility and 6 total employees.

TABLE 5-12. NUMBERS OF WORKERS AND MECHANICS AT FACILITY LOCATION FOR AUTO REPAIR AND BODY SHOPS (n = 131)

<i># Mechanics</i>	<i># Facilities</i>	<i>#Employees</i>	<i># Facilities</i>
0	11	0	0
1	25	1	3
2-4	67	2-4	73
5-9	13	5-9	32
10-19	5	10-19	8
20-49	3	20-49	7
50-99	0	50-99	1
100-199	0	100-199	0
≥ 200	0	≥ 200	0
Total # Facilities	124	124	
No Answer	7	7	
Total # Workers	414	723	
Avg. # Workers	3.3	5.8	

Table 5-13A shows the numbers of vehicles for service at auto repair and body shops. The median range is 1 to 5 vehicles for all five vehicle types: auto, LDT, MDV, HDT and MC. The average number of vehicles per facility is 5 for auto, 0.7 for LDT, 0.3 for MDV and HDT, and zero for MC. The numbers of vehicles left overnight on days preceding the interviews are listed in Table 5-13B for all five vehicle types. The numbers of such vehicles

left overnight are nearly as large as the numbers of total vehicles at these facilities.

TABLE 5-13A. NUMBER OF VEHICLES AT AUTO REPAIR AND BODY SHOPS (n = 131).

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	43	25	9	3	1
6-10	21	2	2	1	0
11-50	12	1	1	2	0
51-100	1	0	0	0	0
> 100	0	0	0	0	0
Total # Facilities	77	28	12	6	1
NA*	54	103	119	125	130
Total # Vehicles	648	92	43	40	1
Avg. # Vehicles**	4.9	0.7	0.3	0.3	0.0

* Not applicable or no answer.

**

Averaged over all surveyed facilities, i.e., n = 131.

TABLE 5-13B. NUMBER OF VEHICLES LEFT OVERNIGHT ON PREVIOUS DAY AT AUTO REPAIR AND BODY SHOPS (n = 131)

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	36	17	8	2	0
6-10	10	1	1	0	0
11-50	9	1	0	2	0
50-100	1	0	0	0	0
> 100	0	0	0	0	0
Total # Facilities	56	19	9	4	0
NA*	74	112	122	127	131
Total # Vehicles	464	59	34	29	0
Avg. # Vehicles**	3.5	0.5	0.3	0.2	0.0

* Not applicable or no answer.

** Averaged over all surveyed facilities, i.e., n = 131.

Table 5-14A shows how long these overnight vehicles stayed for service at auto repair and body shops. The usual length of stay is rather short: the median length is 2 days for auto and 1 day for LDT MDV and HDT. The number of vehicles for service at auto repair and body shops fluctuated with

TABLE 5-14A. NUMBER OF DAYS REMAINING AT LOTS BEFORE BEING MOVED ELSEWHERE FOR AUTO REPAIR AND BODY SHOPS.

<i>Length of Stay</i>	<i>Number of Vehicles</i>				
	<i>Auto</i>	<i>LDT</i>	<i>MDV</i>	<i>HDT</i>	<i>MC</i>
1 Day	194	33	22	17	0
2 Days	89	0	2	11	0
3 Days	53	8	2	1	0
≥4 Days	128	18	3	0	0
Total # Vehicles	464	59	34	29	0
Median # Days	2	1	1	1	-

TABLE 5-14B. RELATIVE INVENTORY LEVEL IN JUNE THROUGH SEPTEMBER AS COMPARED TO THE LEVEL AT INTERVIEW FOR AUTO REPAIR AND BODY SHOPS.

<i>Inventory Level</i>	<i>Number of Facilities</i>			
	<i>June</i>	<i>July</i>	<i>August</i>	<i>September</i>
Considerably higher	12	10	10	10
Somewhat higher	13	14	15	15
About the same	30	30	29	30
Somewhat lower	12	12	12	11
Considerably lower	5	5	5	5
Total # Facilities	72	71	71	71

Table 5-15 provides the estimated number of vehicle diurnals at auto repair and body shops in the SoCAB. Autos exhibit by far the largest number of vehicle diurnals, accounting for 78 percent of total vehicle diurnals, which are estimated to be 53,000.

TABLE 5-15. ESTIMATED NUMBER OF VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING AT AUTO REPAIR AND BODY SHOPS IN THE SoCAB.

# Auto Repair and Body Shop Facilities with Cars	$13,433 \times (131/150) =$			11,731
Auto	$11,731 \times (3.5)$	=		41,059
LDT	$11,731 \times (0.5)$	=		5,866
MDV	$11,731 \times (0.3)$	=		3,519
HDT	$11,731 \times (0.2)$	=		2,346
MC	$11,731 \times (0.0)$	=		0
Total # Vehicles in Diurnals				52,790

5.3.4 SCRAP AND DISMANTLING YARDS

The SIC group defined for scrap and dismantling yards includes the following SIC's (see Table 2-4):

5093 Scrap and Waste Materials

Establishments primarily engaged in assembling, breaking up, sorting, and wholesale distribution of scrap and waste materials. This industry includes auto wreckers engaged in dismantling automobiles for scrap. However, those engaged in dismantling cars for the purpose of selling secondhand parts are classified in Industry 5015.

5931 Used Merchandise Stores

This industry includes stores primarily engaged in the retail sale of used merchandise, antiques, and secondhand goods such as clothing and shoes; furniture; books and rare manuscripts; automobile parts, accessories, tires, batteries; musical instruments; office furniture; phonographs and phonograph records; and store fixtures and equipment. This industry also includes pawnshops. Dealers primarily engaged in selling used motor vehicles, trailers, and boats are classified in Major Group 55; used mobile homes in Industry 5271; and establishments primarily engaged in automobile repair in Group 753. Scrap, waste, and junk dealers are classified in Industry 5093.

Although the first SIC, 5093, appears to be relevant for scrap and dismantling yards, the second SIC, 5931, is of dubious value because it includes businesses different from the business type of interest.

Unlike the other facility types, this stratum, scrap and dismantling yards, showed a very high proportion of facilities without vehicles: 35 out of 40 surveyed facilities (see Table 5-1A). As a hindsight, such a high proportion of no-car facilities could have been avoided by limiting this stratum to the first SIC only. Table 5-16 shows the number of facilities having one of the two SIC's in their primary or secondary business activities in the SoCAB.

TABLE 5-16. NUMBER OF FACILITIES WITH DESIGNATED SIC'S FOR THEIR PRIMARY OR SECONDARY BUSINESSES IN THE SoCAB.

SIC	Number of Facilities		Total	Percent
	Primary	Secondary		
5093	457	86	543	16.9
5931	1,744	921	2,665	83.1
Group Total	2,201	1,007	3,208	100

Review of the 40 completed questionnaires has revealed that all five facilities with vehicles are from the first SIC, 5093. Therefore, should the sample be drawn all from the first SIC, the number of facilities with vehicles would have been $5/0.169 = 30$ instead of 5, where the denominator is the percentage of facilities with SIC 5093 in the SoCAB (see Table 5-16). Thus, the proportion of facilities with vehicles would have been 75 percent ($= 30/40$) instead of 13 percent ($= 5/40$).

It should be noted that the estimated number of vehicle diurnals at scrap and dismantling yards would not be altered even if only the first SIC were used for the estimation (note $3208 \times 5/40 = 543 \times 30/40$).

Table 5-17 shows the numbers of all vehicles and those containing gasoline at the five surveyed facilities with vehicles. The average number of vehicles is 164 for auto, 10 for HDT, and 0.4 for MC. The average number of vehicles containing gasoline in their fuel tanks is 0.6 for auto and 1.4 for HDV.

TABLE 5-17. NUMBER OF VEHICLES AT SCRAP AND DISMANTLING YARDS (n = 5).

# Vehicles	Number of Facilities				
	Auto	LDT	MDV	HDT	MC
1-5	0	0	0	0	1
6-10	0	0	0	0	0
11-50	1	0	0	1	0
51-100	1	0	0	0	0
100	1	0	0	0	0
Total # Facilities	3	0	0	1	1
NA*	37	40	40	39	39
Total # Vehicles	820	0	0	50	2
Avg # Vehicles	164.0	0	0	10.0	0.4
# Vehicles w/Gas	3	0	0	7	0
Avg. # Veh. w/Gas	0.6	0	0	1.4	0

Table 5-18 shows the estimated number of vehicle diurnals at scrap and dismantling yards. The number of vehicle diurnals at scrap and dismantling yards is estimated to be 802, a minuscule number as compared to those for vehicle dealers and rental/leasing agents which range in tens of thousands to hundreds of thousands.

TABLE 5-18. ESTIMATED NUMBER OF VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING AT SCRAP AND DISMANTLING YARDS IN THE SoCAB.

# Scrap and Dismantling Facilities with Cars		$3208 \times (5/40)$	=	401
Auto	$401 \times (0.6)$		=	241
LDT	$401 \times (0.0)$		=	0
MDV	$401 \times (0.0)$		=	0
HDT	$401 \times (1.4)$		=	561
MC	$401 \times (0.0)$		=	0
Total # Vehicles in Diurnals				802

5.3.5 PARKING AND CAMPGROUND AREAS

The number of parking and camping facilities in the Dun's business list for the SoCAB is smaller than those for the other facility categories by nearly an order of magnitude (see Table 5-16). There seem to be two reasons for this:

1. A managing company often manages several parking or camping facilities. The Dun's list records the managing company, not individual facilities; and
2. Many parking facilities owned by large corporations do not generate enough income to be considered as their major business activities. Thus, many of these facilities may not even be listed as secondary SIC facilities in the Dun's list.

A total of 40 managing companies (hereafter called "facilities" for consistency with the preceding sections) were successfully surveyed. The employment sizes of these facilities are summarized in Table 5-19. The average number of employees is 9 for a facility location and 13 in an entire company. However, there are many small facilities with 2 to 9 employees.

Table 5-20A shows the number of parking spaces at these facilities. It varies greatly, from less than 20 parking spaces to over 500 parking spaces, with the average of 202 parking spaces per facility. Table 5-20B shows the number of vehicles left overnight at these facilities. A total of 1,049 vehicles were left overnight on days preceding the interviews at 22 of the 40 surveyed facilities. The average number of such vehicles per facility is 36, which is a little over one tenth of the total parking spaces.

TABLE 5-19. NUMBER OF EMPLOYEES AT FACILITY LOCATION AND IN ENTIRE COMPANY FOR PARKING AND CAMPGROUND AREAS (n = 40).

# Employees	Number of Facilities	
	At Location	Entire Company
1	2	1
2-4	16	10
5-9	12	7
10-19	6	8
20-49	3	3
50-99	1	1
100-199	0	0
≥ 200	0	0
Total # Facilities	40	30
No Answer	0	10
Total # Employees	368	386
Avg. # Employees	9.2	12.9

TABLE 5-20A. NUMBER OF PARKING SPACES AT PARKING AND CAMPGROUND AREAS (n = 40).

Parking Spaces	Number of Facilities
< 20	10
20-50	9
51-100	4
101-500	12
> 500	5
Total # Facilities	40
NA*	0
Total # Vehicles**	8,073
Avg. # Vehicles***	201.8

* Not applicable or no response.

** Estimated using mid-point of each range of vehicles (10 for < 20, 150 for > 100, and 750 for > 500).

*** Averaged over all surveyed facilities.

TABLE 5-20B. NUMBER OF VEHICLES LEFT OVERNIGHT AT PARKING AND CAMPGROUND AREAS (n = 40).

<i># Vehicles</i>	<i>Number of Facilities</i>
0	1
1-5	5
6-10	3
11-50	6
51-100	3
> 100	4
Total # Facilities	22
NA*	18
Total # Vehicles**	1,049
Avg. # Vehicles***	26.2

* Not applicable or no response.

** Estimated using mid-point of each range of vehicles (10 for 20, 150 for 100, and 750 for 500).

*** Averaged over all surveyed facilities.

Table 5-21 shows the relative levels of overnight parking in June through September as compared to the levels at the time of interviews. It indicates that the number of vehicles parked overnight at parking and campground areas tends to be somewhat fewer than that at the interview time of December through February.

TABLE 5-21. EXTENT OF OVERNIGHT PARKING IN JUNE THROUGH SEPTEMBER AS COMPARED TO THE LEVEL AT INTERVIEW FOR PARKING AND CAMPGROUND AREAS.

<i>Overnight Parking</i>	<i>June</i>	<i>Number of Facilities</i>			<i>September</i>
		<i>July</i>	<i>August</i>		
Considerably greater	1	1	1		1
Somewhat greater	1	1	1		1
About the same	11	11	11		12
Somewhat fewer	2	2	2		2
Considerably fewer	4	4	4		4
Total # Facilities	19	19	19		20

Table 5-22 shows the primary usages of parking spaces at surveyed facilities. About 60 percent of them are designed for all vehicles whereas 40 percent are for special types of vehicles. Of those parking spaces for special vehicles, 53 percent are for autos, 12 percent for vans and limousines, and 35 percent for recreational vehicles and trucks. Assuming that vans and limousines belong to

LDT or MDV and recreational vehicles and trucks to HDT, the number of vehicle diurnals in the SoCAB is estimated in Table 5-23 for four vehicle types: auto, LDT/MDV, HDT, and MC. In total, there are 12,000 vehicle diurnals at parking and campground areas in the SoCAB.

TABLE 5-22. PRIMARY USAGE OF PARKING SPACES AT PARKING AND CAMPGROUND AREAS.

<i>Primary Usage of Parking Space</i>	<i># Facilities</i>	<i>Percent</i>
All vehicles	23	57.5
Special vehicles	17	42.5
Total	40	100
Vehicle Type for Specialized Parking		
Autos	9	52.9
Vans	1	5.9
Limousines	1	5.9
Recreational vehicles	5	29.4
Trucks	1	5.9
Sub-Total	17	100

TABLE 5-23. ESTIMATED NUMBER OF VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING AT PARKING AND CAMPGROUND AREAS IN THE SoCAB.

<i>Parking and Camping Facilities with Cars</i>	<i>467 x (40/40)</i>	<i>=</i>	<i>467</i>
Auto	$467 \times (26.2 \times 0.53)$	=	6,488
LDT and MDV	$467 \times (26.2 \times 0.12)$	=	1,468
HDT	$467 \times (26.2 \times 0.35)$	=	4,282
MC	$467 \times (26.2 \times 0.00)$	=	0
Total # Vehicles in Diurnals			12,238

In addition to the telephone questionnaire survey on parking and campground areas, we also made an observational survey by actually visiting a few selected parking facilities at night. In early February, two student surveyors visited at midnight (i.e., 2 A.M. to 4 A.M.), parking facilities near Los Angeles International Airport, Burbank-Glendale-Pasadena Airport, and Flyaway Bus Terminal in Van Nuys. Table 5-24 summarizes their observational data on the numbers of parking spaces and parked vehicles in those facilities.

TABLE 5-24. SPECIAL AIRPORT PARKING SURVEY - DATA SUMMARY.

<i>Parking Area/\$ per Day</i>	<i>Parking Spaces</i>	<i>Number of Parked Vehicles</i>			<i>Percent Used</i>
		<i>Calif.</i>	<i>Out-of-State</i>	<i>Total</i>	
<u>Los Angeles International Airport</u>					
Lot B \$8/Day	6,295	1,621	132	1,753	28%
Lot # 1 \$10/Day	1,155	567	27	594	51%
<u>Burbank Airport</u>					
Short Term \$18/Day	465	109	1	110	24%
Long Term \$8/Days	424	266	9	275	65%
<u>Flyaway Bus Terminal</u>					
Van Nuys \$1/Day	2,170	704	48	752	35%
Survey Total	10,509	3,267	217	3,484	33%

In total, they found about 3,500 parked vehicles over 10,500 available parking spaces. This means that fully one third of the parking spaces were in use for parking even at such midnight hours in these parking facilities. The surveyors also counted out-of-state vehicles separately from California registered vehicles, and found that out-of-state vehicles accounted for 6 percent of total parked vehicles.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

To characterize the frequency, soak duration and soak locations of all gasoline-fueled on-road vehicles soaking for multi-days in the SoCAB, three separate surveys were designed and implemented:

1. Household Survey. Storage patterns of privately-owned vehicles were surveyed by telephone for 500 randomly selected household in the SoCAB, using a specially devised random digit dialing method. Selected vehicles at these households were further surveyed by having the vehicle operators maintain a diary of vehicle non-uses over an 8-day period.
2. Business Vehicle Survey. Storage patterns of commercially-owned vehicles (i.e., those owned by organizations) were surveyed by telephone for 100 fee-exempt vehicles, 200 fee-paid small trucks (e.g., pickups, vans, panel trucks, etc.), and 100 fee-paid full trucks, which were selected from the Department of Motor Vehicles (DMV) records according to a stratified random sampling method.
3. Facility Survey. Storage patterns of vehicles were surveyed by telephone for 50 vehicle dealers, 40 rental and lease agents, 130 auto repair and body shops, 40 scrap and dismantling places, and 40 parking and camping facilities. A follow-up survey using a survey postcard was also administered to some of the surveyed facilities on a voluntary basis.

According to the household survey, the percentages of all vehicles soaking for 24-hours or longer were 23 percent on weekdays and 31 percent on weekend days, with the overall average of 25 percent. Of the basinwide population of 8.1 million privately-owned vehicles, the number of vehicles experiencing multi-day soaking was estimated to be 1.9 million on weekdays and 2.5 million on weekend days. The percentage of these vehicles soaking for given periods decreased as the soak period increased: 34% on 1-day soak (i.e., over 24-hours but less than 48-hours), 22% on 2-day soak, 12% on 3-day soak, and 32% on 4-day or longer soak.

The number of commercially-owned vehicles was estimated to be 374,000 as of July 1987. Of these commercially-owned vehicles, the number of vehicles soaking for 24 hours or longer was estimated to be 80,000 (21%) on weekdays

and 279,000 (75%) on weekend days. The overall mean percentage of commercially-owned vehicles on multi-day soak is 37%.

The facility survey was conducted to estimate the number of pre-registered vehicles at new car dealers and the number of privately-owned or commercially-owned vehicles which were temporarily or permanently dislocated to vehicle holding facilities such as vehicle dealers, vehicle rental and leasing agents, auto repair and body shops, and scrap and dismantling yards. The numbers of vehicles experiencing multi-day soaking at these facilities are listed in Table 6-1.

The table shows that there were 292,000 vehicles daily experiencing multi-day soaking at these facilities. Of these, 154,000 (53%) were new, pre-registered vehicles at auto and truck dealers, while 47 percent were registered, used vehicles. As to vehicle types, autos were the most numerous (189,000), accounting for 65%. LDT, MDT, HDT and motorcycles accounted for 14, 6, 7 and 8 percent, respectively.

TABLE 6-1. ESTIMATED NUMBERS OF VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING AT VARIOUS TYPES OF FACILITIES IN THE SoCAB

<i>Type of Facility</i>	<i>Auto</i>	<i>LDT</i>	<i>MDT</i>	<i>HDT</i>	<i>MC</i>	<i>Total</i>
Vehicle Dealers	136,192	32,479	8,069	3,731	23,961	204,432
Pre-registered vehicles	95,122	26,805	6,988	2,920	21,799	153,634
Registered vehicles	41,070	5,674	1,081	811	2,162	50,798
Vehicle Rental and Leasing	4,574	3,267	3,848	10,309	0	21,998
Auto Repair and Body Shops	41,059	5,866	3,519	2,346	0	52,790
Scrap and Dismantling Yards	241	0	0	561	0	802
Parking and Campgrounds	6,488	1,734*	734*	4,2820	0	12,238
All Facilities	188,554	42,346	16,170	21,229	23,961	292,260
Pre-registered vehicles	95,122	26,805	6,988	2,920	21,799	153,634
Registered vehicles	93,432	15,541	9,182	18,309	2,162	138,626

* The original estimate was made for the sum of LDT and MDT.

Table 6-2 summarizes the numbers of vehicles on multi-day soak for weekdays and weekends. On weekdays, there were 2.0 million vehicles on multi-day soak in the SoCAB, while on weekends, there were 2.9 million such vehicles. Of the 2.0 million vehicles on multi-day soak on weekdays,

privately-owned vehicles accounted for 88 percent while commercially-owned vehicles accounted for 4 percent. The remaining 8 percent was accounted for by new, pre-registered vehicles at dealers and new car preparation lots. About 7.5 percent of privately- or commercially-owned vehicles on multi-day soak were located at vehicle holding facilities such as used-car sales lots, repair shops and parking lots.

TABLE 6-2. ESTIMATED NUMBERS OF VEHICLES DAILY EXPERIENCING MULTI-DAY SOAKING ON WEEKDAYS AND WEEKENDS IN THE SoCAB

<i>Type of Vehicles</i>	<i># Vehicles In Stock</i>	<i>Weekdays</i>	<i>Weekends</i>
1. Privately-owned vehicles	8,130,000	1,878,000	2,504,000
2. Commercially-owned vehicles	374,000	80,000	279,000
3. Pre-registered vehicles*	Unknown	154,000	154,000
4. Dislocated vehicles*	Unknown	139,000	139,000
Sum of 1, 2 and 3		2,112,000	2,937,000

* The same number of vehicles experiencing multi-day soaking was assumed for weekdays and weekends.

UNK = Unknown

6.2 RELIABILITY OF ESTIMATES

Various estimates of vehicle storage patterns were made in this study, using the information gathered by telephone questionnaire surveys on privately-owned and commercially-owned vehicles, and new and used vehicles at vehicle holding facilities. Inevitably, these estimates were subject to both response errors and random sampling errors. To infer the magnitude of response errors in basic data gathered under this study, a diary survey, in which owners of the selected vehicles kept diaries of their vehicle uses for a period of eight consecutive days, was conducted for a subset of 141 privately-owned vehicles amount those identified in the household survey.

These 142 vehicles provided a special data base in which the frequency of occurrences of vehicles soaking for multi-days was estimated by two independent data sets: one from the questionnaire responses and the other from the completed diaries. Both the total number of vehicle diurnals and the durations of those diurnals turned out to agree quite well for the two data sets, indicating that the estimates based on the telephone questionnaire

responses are, overall, about as accurate as those by the diary survey. Therefore, errors in the questionnaire responses are probably random rather than systematic in nature for both the household survey and business vehicle survey.

Random sampling errors for the two surveys, are expected to differ, however, because the sampling unit for the household survey was a "household" while that for the business vehicle survey was a "vehicle". Both surveys were designed to estimate the following ratio:

$$R = \frac{\text{Total number of privately-owned vehicles soaking for multi-days}}{\text{Total number of privately-owned vehicles in circulation}} \quad (6-1)$$

For the business vehicle survey, this ratio is given by a binomial distribution parameter, p , the proportion of vehicles with diurnals among all surveyed vehicles. Therefore, its sampling error is given for a 95 percent confidence level as:

$$2s = 2\text{SQRT } [p(1-p)/n] \quad (6-2)$$

The 95 percent confidence limits for the estimated proportions of commercially-owned vehicles with diurnals (shown in Table 4-11) are computed in Table 6-3 using Eq. (6-2).

TABLE 6-3. NINETY-FIVE PERCENT CONFIDENCE LIMITS FOR ESTIMATED PROPORTIONS OF COMMERCIALY-OWNED VEHICLES WITH DIURNALS FOR EACH DAY OF THE WEEK (n = 367)

	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>	<i>Sun</i>	<i>Week Total</i>
Proportion	.23	.21	.19	.20	.24	.71	.78	.37
95% Conf. Limit $\pm .04$	$\pm .04$	$\pm .04$	$\pm .04$	$\pm .04$	$\pm .04$	$\pm .05$	$\pm .04$	$\pm .05$

It is interesting to note that although the estimated proportions vary from 0.19 to 0.78, the 95 percent confidence limits remain about the same, ± 0.04 or ± 0.05 . Therefore, "true" proportion is expected to be found within 4 to 5 percentage points around each estimated proportion in 19 out of 20 cases, regardless of the value of the estimated proportion.

Unlike the business vehicle survey, the household survey of privately-owned vehicles used a household as the sampling unit. In this case, the ratio defined by Eq (6-1) is estimated by:

$$\begin{aligned}\hat{R} &= \text{SUM}_i (Y_i) / \text{SUM}_i (x_i) \quad (i = 1, 2, \dots, n) \\ &= \bar{y} / \bar{x}\end{aligned}\tag{6-3}$$

where

\hat{R} = an estimate of the "true" ratio R

x_i = total number of vehicles at the i -th household

y_i = number of vehicles on multi-day soak

\bar{x} = sample mean of x_i

\bar{y} = sample mean of y_i

n = number of surveyed households having one or more vehicles ($n = 450$).

Random sampling error for \hat{R} is given for a 95 percent confidence level as:

$$2s = 2\text{SQRT}[\text{SUM}_i (y_i - \hat{R}x_i)^2] / \bar{x}\text{SQRT}[n(n-1)]\tag{6-4}$$

Since the data base developed under this study was not well adapted for determining daily soaking conditions for individual vehicles, a sampling error was computed for an overall ratio of vehicles on multi-day soak during the one-week period.

The overall ratio, $\hat{R} = \bar{y}/\bar{x}$, turned out to be $\hat{R} = 1.01/2.00 = 0.51$. Its 95 percent confidence limits were ± 0.05 around that value.

It should be noted that although the household survey identified over 900 vehicles, the sampling error of the estimated proportion of vehicles on multi-day soak was determined by a subset of the survey sample, namely, the number of surveyed households having one or more gasoline-fueled vehicles. For error analysis, the effective sample size was reduced from the nominal

sample sizes of 931 surveyed vehicles and 528 surveyed households to 450 households having one or more gasoline-fueled vehicles.

Since the sampling errors for the estimated proportions by the household survey ($n = 450$) and by the business vehicle survey ($n = 367$) are about the same, there is no apparent advantage of a household-based survey (by identifying more than one vehicle per household) over a vehicle-based survey.

Error analysis for results of the facility survey was too cumbersome for inclusion in this study. However, both random sampling errors and response errors in those results appeared to be larger than the errors in the household and business vehicle survey results, because of the smaller sample sizes (5 for scrap and dismantling yards to 131 for auto-repair and body shops) and the lower response rates for key questionnaire questions.

6.2 RECOMMENDATIONS

In this study, we conducted two vehicle user surveys and five holding facility surveys. The user surveys were a household survey for privately-owned vehicles and a business vehicle survey for commercially-owned vehicles. These user surveys yielded data on vehicle storage at various holding facilities as well as data on periods of vehicle non-use during the week prior to the survey interview. Although no comparison was made in this study, the numbers and durations of vehicle diurnals determined from these storage data at holding facilities should agree reasonably well with those estimated from the five facility surveys: vehicle dealers, vehicle rentals and leases, auto-repair and body shops, scrap and dismantling yards, and parking and campgrounds. Such comparisons, if made, would lend some confidence as to the accuracy of the current estimates of vehicle diurnals at these holding facilities.

The diary survey was solicited for 452 interviewees of whom 325 expressed their willingness to participate. Of these volunteers, 141 returned completed diaries of hourly vehicle uses for the 8-day period. Although we analyzed the diaries only to determine the numbers and durations of vehicle diurnals, these diaries also provided very specific, reliable data on vehicle uses and non-uses including storage facilities.

As discussed in the preceding section, a vehicle-based survey is quite effective for controlling the sampling errors as compared to a household-based survey. Therefore, in any future study, a diary survey of randomly selected

vehicle owners from DMV registration record should be considered in order to improve the accuracy of current estimates of periods of extended vehicle non-use in the SoCAB.

7.0 REFERENCES

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Lobb, O., "The 1976 Urban and Rural Travel Survey: Volume IV - Summary of Findings", California Department of Transportation and Southern California Association of Governments, Los Angeles, CA, October 1979.

ARB, "Methodology to Calculate Emission Factors for On-road Motor Vehicles: Supplement I," Air Resources Board, Technical Support Division, Sacramento, CA, January 1988.

Davis, M. B., "The 1976 Urban and Rural Travel Survey: Volume I - Background and Description," California Department of Transportation, Los Angeles, CA, November 1976.

Horie, Y. and J. Cassmassi, "A Study of Driving and Storage Patterns of Nonprimary Private Vehicles in the South Coast Air Basin", Final Report to ARB Contract No. A0-073-31, Pacific Environmental Services, Inc., Santa Monica, CA, August 1981.

Appendix A

Questionnaire for Household Survey

SET NO. _____
(VRC Use Only)

VRC TELEPHONE QUESTIONNAIRE 1060-1

(Attach to Completed Questionnaire)

PHONE NUMBER: () IF MODIFIED, LAST DIGIT

INTERVIEW DATE: / TIME: — AM
 PM

DAY OF WEEK: Mo Tu We Th Fr Sa Su
(Circle)

Good (morning, afternoon, evening) I'm _____ from Valley Research Corporation. We are conducting a survey for the California Air Resources Board. We are studying the vehicle storage patterns of motor vehicles in the South Coast Air Basin to help combat air pollution. Your participation in this study is very important. May I ask you a few questions about your vehicle usage?

INSTRUCTION: MAKE SURE YOU ARE SPEAKING TO AN ADULT MEMBER OF
HOUSEHOLD: IF NOT, ASK TO SPEAK TO AN ADULT RESIDENT OR DETER-
MINE WHEN ONE WILL BE HOME. IF ADULT COMES TO PHONE RESTART
INTRODUCTION. VERIFY TELEPHONE NUMBER: IF INCORRECT, APOLOGIZE,
TERMINATE AND REDIAL.

- Q1. How many vehicles does anyone in your household own, use regularly, or lease including those of overnight visitors, if any, who are from places outside the four counties of Los Angeles, Orange, Riverside and San Bernardino?

(WRITE THE NUMBER OF VEHICLES IN APPROPRIATE SPACE)

_____ None -- THANK YOU AND TERMINATE
_____ Passenger cars
_____ Vans
_____ Pick-ups
_____ Campers/Motor Homes
_____ Motor cycles/mopeds/ATV
_____ Other (specify) _____

- Q2. Do any of these vehicles run on diesel or other non-gasoline fuel. (WRITE THE NUMBER OF VEHICLES IN APPROPRIATE SPACE)

1. NO SKIP TO Q3
2. YES IDENTIFY VEHICLE TYPES BELOW

Passenger cars	_____ Diesel	_____ Other
Vans	_____ Diesel	_____ Other
Pick-ups	_____ Diesel	_____ Other
Campers/Motor Homes	_____ Diesel	_____ Other
Others	_____ Diesel	_____ Other

(DO NOT INCLUDE THESE VEHICLES IN SUBSEQUENT QUESTIONS)

PART (A) VEHICLE USE QUESTION.

FOR Q3 THRU Q9, USE ANSWER SHEET AT THE END.

- Q3. For those vehicles which run on gasoline, please tell me the make, model, and year of each vehicle.

ESTABLISH VEHICLE IDENTIFICATIONS AS TO V1, V2, ETC.
AND USE THEM CONSISTENTLY THROUGHOUT THE INTERVIEW.

- Q4. What is the registration status of the (Vehicle Name)?
(READ CATEGORIES IN ANSWER SHEET)

- Q5. Approximately how long ago did you last drive the (Vehicle Name)? (READ CATEGORIES)

IF NOT DRIVEN IN LAST 24 HOURS, SKIP TO Q7.

- Q6. During the past 24 hours, how many times did you or someone in your household drive the (Vehicle Name)? (READ CATEGORIES)

COUNT THE NUMBER OF ROUND TRIPS UNLESS THE VEHICLE WAS PARKED LONGER THAN 1 HOUR DURING THE TRIP.

- Q7. Now I would like to ask about actual uses of the (Vehicle Name) in the past seven days. Starting with today, please tell me whether this vehicle was driven in the morning (AM) or in the afternoon (PM).

ASK THIS QUESTION SUCCESSIVELY FOR YESTERDAY, DAY BEFORE YESTERDAY, ETC. FOR ALL VEHICLES

Q8. According to the vehicle uses you just told me about, the (Vehicle Name) was not driven on (SPECIFY) days. Where was this vehicle parked or stored mostly on those days? (READ CATEGORIES)

LIMIT Q8 TO VEHICLES WHICH WERE NOT DRIVEN AT LEAST ONE DAY DURING THE PERIOD.

Q9. When the (Vehicle Name) was not in use during the past seven days, approximately how full did you keep the fuel tank?

PART (B) STORAGE FACILITY QUESTIONS

Q10a. Has any of the vehicles ever been left overnight in an auto-repair shop including body shop?

1. NO SKIP TO Q11a

2. YES IDENTIFY VEHICLES

→ When did the last such event occur for the (Vehicle Name)?

	V	V	V	M	M
Right now	1	1	1	1	1
Less than a week ago	2	2	2	2	2
Less than a month ago	3	3	3	3	3
One to six months ago	4	4	4	4	4
More than six months ago	5	5	5	5	5

Q10b. How long was the (vehicle Name) left there?

	V	V	V	M	M
Less than 24 hours	1	1	1	1	1
24 to 48 hours	2	2	2	2	2
48 hours or longer	3	3	3	3	3
IF 3, SPECIFY # DAYS	___	___	___	___	___

(REPEAT Q10a FOR NEXT VEHICLE)

Q11a. Has any of the vehicles ever been parked overnight in a parking lot like those at airports and bus terminals within the four counties: Los Angeles, Orange, Riverside and San Bernardino?

1. No SKIP TO Q12a

2. Yes IDENTIFY VEHICLES

→ When did the last such event occur for the (Vehicle Name)?

	V	V	V	M
Right now	1	1	1	1
Less than a week ago	2	2	2	2
Less than a month ago	3	3	3	3
One to six months ago	4	4	4	4
More than six months ago	5	5	5	5

Q11b. How long was the (Vehicle Name) parked there?

	V	V	V	M
Less than 24 hours	1	1	1	1
24 to 48 hours	2	2	2	2
48 hours or longer	3	3	3	3
IF 3, SPECIFY # DAYS	_____	_____	_____	_____

(REPEAT Q11a FOR NEXT VEHICLE)

Q12a. Has any of the vehicles ever been parked and unused for 24 hours or more at recreational areas such as a campground, park, beach, hotel, motel, or ski area within the four counties: Los Angeles, Orange Riverside and San Bernardino?

1. NO SKIP TO Q13
 2. YES IDENTIFY VEHICLES
- Where did this occur for the (Vehicle Name)?

	V	V	M
Campground or park	1	1	1
Beach or wilderness	2	2	2
Hotel/motel but not in ski area	3	3	3
Ski area	4	4	4

Q12b. When did the last such event occur for the (Vehicle Name)?
(SPECIFY BOTH VEHICLE AND RECREATIONAL AREA)

	RA	V	V	RA	M	M
Right now	1	1	1	1	1	1
Less than a week ago	2	2	2	2	2	2
Less than a month ago	3	3	3	3	3	3
One to six months ago	4	4	4	4	4	4
More than six months ago	5	5	5	5	5	5

(REPEAT Q12a FOR NEXT VEHICLE)

Q13. During the past 30 days, did your family travel beyond the four county area for more than 24 hours?

1. No SKIP TO Q15
2. Yes SPECIFY # DAYS _____

Q14. During the travel, where was each of your vehicles stored or parked? (READ CATEGORIES IN ANSWER SHEET)

PART (E) CLASSIFICATION QUESTIONS

Q15. Do you live in

Single detached house,	1
Apartment or duplex,	2
Condominium or townhouse,	3
Mobile home, or	4
Something else? _____	5

Q16. How many people live in your household? _____

Q17. How many of them are licensed drivers? _____

PART (F) SOLICITATION QUESTION

Q18. Finally, I would like to ask you to keep a record of your actual vehicle uses for about 10 days. If I send you a card, would you be willing to fill-in the card about your actual vehicle uses. As a token of our appreciation, we will send you a check of 10 dollars after we receive your filled-out card.

1. No, I am not interested THANK YOU AND TERMINATE
2. Yes, I would like to do that ... ASK Q19.

Q19. To send you the card, may I have your name and street address?

Name: _____

Street: _____

City: _____

Zip Code: _____

THANK YOU AND TERMINATE

VEHICLE INFO

- | | | |
|-----------------------|---------------------------|--------------------------|
| Q4. REGISTRATION | Q5. HOW LONG AGO | Q6. DURING PAST 24 hours |
| 1. Current California | 1. Being used now | 1. None |
| 2. Expired California | 2. Less than 3 hours ago | 2. Once |
| 3. Out of State | 3. Less than 12 hours ago | 3. 2 to 4 times |
| 4. Not Registered | 4. Less than 24 hours ago | 4. 5 times or more |
| | 5. 24 hours or more | |
| | (SPECIFY # DAYS) | |

Q3.	Make	Model	Year	Q4. Registration				Q5. How Long Ago					Q6. Past 24 hrs.				
V1	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
V2	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
V3	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
V4	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
V5	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
<hr/>																	
M1	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
M2	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4
M3	_____	_____	_____	1	2	3	4	1	2	3	4	5	_____	1	2	3	4

NOTE: (1) V = Car/Van/Truck, M = Motor cycle/Moped/ATV
(2) Gasoline-powered vehicles only

ACTUAL USE

Q7. Put x mark in appropriate spaces if it was driven

- | | | |
|--------------------------------|-------------------|------------------------|
| Q8. STORAGE | Q9. HOW FULL | Q14. TRAVEL |
| 1. Outdoors exposed to the sun | 1. About full | 1. Outdoors Exposed |
| 2. Roofed carport/shaded area | 2. About 1/2 full | 2. Shaded Area |
| 3. Enclosed garage | 3. Nearly empty | 3. Enclosed Garage |
| | | 4. Used for the travel |

Q7. Uses in Past 7 Days								Q8. Storage		Q9. How Full	Q14. Travel			
D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇							
V1 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
V1 PM	___	___	___	___	___	___	___							
V2 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
V2 PM	___	___	___	___	___	___	___							
V3 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
V3 PM	___	___	___	___	___	___	___							
V4 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
V4 PM	___	___	___	___	___	___	___							
V5 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
V5 PM	___	___	___	___	___	___	___							
M1 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
M1 PM	___	___	___	___	___	___	___							
M2 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
M2 PM	___	___	___	___	___	___	___							
M3 AM	___	___	___	___	___	___	___	1	2	3	1	2	3	4
M3 PM	___	___	___	___	___	___	___							

NOTE: D-0 = today, D-1 = yesterday, etc.

Appendix B

Rules and Info Sheet for Household Survey

RULES FOR TELEPHONE INTERVIEW
(Project 1060 : Household Survey)

1. Record every interview attempt and its outcome in the "Call Record Table". Indicate the attempt's outcome using one of the following codes:

** C = Complete	B = Line busy
CB = Call back (when? who? number?)	A = Answer machine/service
R = Flat refusal (why?)	N = No answer (after 6 to 8 rings)
T = Respondent Terminated (why?)	L = Language problem (specify)
D = Disconnected No., Not in Service w/no new no., or Dead Line	G = Government number
	BS = Business number

2. Make seven attempts to connect before abandoning each phone number, by calling different times of the day and different days of the week.
3. Increase the last digit of the number called by one (e.g., 454-5065 to 454-5066) if the number called turns out to be:
 - o Non-working number;
 - o Disconnected number w/o a new number;
 - o Disconnected number w/ a new number in a different prefix. (If in the same prefix, call the new number.); and
4. The modification of the phone number by adding 1 to the number shall not be allowed more than 3 times (i.e., the number + 3 is O.K., but the number + 4 is not O.K.).
5. If the number called results in the following, go to the next number in the list:
 - o Business number
 - o Government number
 - o Refusal
 - o No answer even after 7 attempts were made.

PROJECT INFO SHEET

WHAT THE RESPONDENT MIGHT LIKE TO
KNOW ABOUT THIS STUDY

A. ABOUT THE STUDY

1. WHO IS VALLEY RESEARCH?

Valley Research Corporation, also known as VRC, is a Los Angeles based independent engineering-consulting firm. We specialize in a variety of environmental services related to both government and private research programs.

2. WHO IS SPONSORING (PAYING FOR) THIS STUDY?

It is being sponsored and paid for by the State of California Air Resources Board, commonly known as CARB, located in Sacramento.

3. WHAT IS THE TITLE OF THE STUDY?

The title of the project is "A Study of Multi-Day Storage Patterns for Gasoline-Fueled Vehicles in the South Coast Air Basin", and is being performed under CARB contract A6-196-32.

4. WHAT IS THE SOUTH COAST AIR BASIN?

The Basin is comprised of the urban or urbanizing areas of Los Angeles, Orange, San Bernardino, and Riverside Counties.

5. WHAT IS THE PURPOSE OF THIS STUDY?

There are two types of emissions from motor vehicles: exhaust gases and evaporative loss of fuel. The objective of this study is to estimate the amounts of gasoline evaporation arising from motor vehicles when they are not used. These estimates will be used to develop a better, more efficient charcoal canister to trap gasoline vapors from the fuel tank.

6. WHO IS RESPONSIBLE FOR THIS SURVEY?**MAY I TALK TO THAT PERSON?**

You may talk to either Yuji Horie or Arthur Shrope of VRC. I am sure that either would be happy to talk to you. They can be reached at 818-902-0022.

B. ABOUT THE RESPONDENTS**1. HOW WERE WE PICKED FOR THE SURVEY?**

Your household was drawn at random from the telephone prefix areas in the South Coast Air Basin.

2. HOW CAN I BE SURE THIS IS AUTHENTIC?

I can give you the number of Valley Research and you can call them for verification. The number is 818-902-0022.

3. MUST I AGREE TO THIS INTERVIEW?

This request for your participation is completely voluntary and there is no penalty on you for not answering some or all of the questions. I would like to say, however, that since this is a scientific rather than a marketing or sales survey, it is awfully important we interview everyone in our random sample; otherwise the study won't be very useful because we won't get a true picture of the vehicle storage patterns in the Basin. This is the first study of its kind in California. Therefore, the results are of particular importance to us and our law-makers now considering the best formulation of public policies for the planning and development of an improved control system for evaporative emissions from motor vehicles.

4. HOW IS THIS INFORMATION GOING TO BE USED?

The information you give will be combined with information gained from some twelve hundred other households,

commercial establishments, and governmental agencies for statistical analysis.

5. IS THIS CONFIDENTIAL?

You can be assured of complete anonymity. VRC regards the information obtained by means of this interview as confidential in the sense that your response will never be traceable back to you. VRC will ensure this by breaking the link between this interview and the questionnaire on which I'm going to record your answers. This will guarantee that such disclosure is not ever possible.

6. WHY DO YOU NEED THE NUMBER OF PEOPLE LIVING IN MY HOUSEHOLD

We need this information to further validate our survey results. This will be accomplished by comparing the household people mix of our sample with the household people mix of the total four-county study area. If the two mixes are similar in character it will be reasonable to assume that our sample mimics the total study area. If not, we'll have more work to do.

Appendix C

Questionnaire for Business Vehicle Survey

VRC#: 320011 774740 TEL: 213-250-6000
NAME: MET WTR DIST S CALIF *1994
ADDR: 1111 SUNSET BL YR: 81
ADDR: 03980
CITY: LOS ANGELES BODY: Pickup

VRC NO. _____

2 TELEPHONE QUESTIONNAIRE 1060-2

Int*	Date	Time	Result**	Comments
1.				
2.				
3.				
4.				
5.				
6.				
7.				

IF COMPLETED, RECORD INTERVIEW TIME: _____ AM DAY OF WEEK: Mo Tu We Th Fr
_____ PM Sa Su

* Interviewer's Initials

** C = Complete

CB = Call back (when? who? number?)

R = Flat refusal (why?)

T = Respondent Terminated (why?)

D = Disconnected No., Not in
Service w/no new no., or
Dead Line

B = Line busy

A = Answer machine/service

N = No answer (after 6 to 8
rings)

L = Language problem (specify)

W = Wrong number

MAKE SEVEN ATTEMPTS TO CONNECT BEFORE ABANDONING THIS LOCATION.

COMPANY/AGENCY: _____ PHONE NO. () _____

MODEL YEAR: _____ BODY TYPE: _____

LICENSE NUMBER: _____ VEHICLE WEIGHT: _____

Good (morning, afternoon, evening) I'm _____ from
Valley Research Corporation. We are conducting a survey for the
California Air Resources Board. We are studying the vehicle
storage patterns of motor vehicles in the South Coast Air Basin
to combat air pollution. May I ask you a few questions about
vehicle usage at your (company/agency)?

INSTRUCTION: ASK IF YOU ARE SPEAKING TO A FLEET MANAGER OR A
VEHICLE OPERATOR AND, IF NOT, ASK TO SPEAK TO A PERSON WHO KNOWS
ABOUT THE VEHICLE USAGE OR DETERMINE WHEN SUCH PERSON WILL BE
HOME OR IN THE OFFICE. IF THE RIGHT PERSON COMES TO THE PHONE,
RESTART INTRODUCTION. VERIFY TELEPHONE NUMBER; IF INCORRECT,
APOLOGIZE, TERMINATE AND REDIAL.

Q1. How many vehicles does your (company/agency) own or lease including trucks and tractors?

1. None SKID TO Q3
2. _____ Vehicles SPECIFY BY VEHICLE TYPE
_____ Motor cycles
_____ Passenger cars
_____ Pick-ups
_____ Two-axle vans
_____ Trucks
_____ Tractors (EXCLUDE TRAILERS)
_____ Other (specify) _____

Q2. Do any of these vehicles run on diesel or other non-gasoline fuel. [WRITE THE NUMBER OF VEHICLES IN APPROPRIATE SPACE]

1. NO SKIP TO Q3
2. YES IDENTIFY VEHICLE TYPES BELOW

Passenger cars	_____	Diesel	_____	Other
Pick-ups	_____	Diesel	_____	Other
Two-axle vans	_____	Diesel	_____	Other
Trucks	_____	Diesel	_____	Other
Tractors	_____	Diesel	_____	Other
Others	_____	Diesel	_____	Other

Q3. According to the Department of Motor Vehicles, your (company/agency) owns (READ MODEL YEAR AND VEHICLE TYPE) vehicle whose license number is (READ LICENSE NUMBER). Do you still own this vehicle?

1. Yes, we still have SKIP TO Q6
2. No, we don't any more } IF NO OTHER VEHICLES OF THIS
3. Don't know } TYPE, CHECK HERE ___ AND TERMINATE

Q4. Among those (SPECIFY VEHICLE TYPE) you have (As Answered in Q1), can you give me the license number and model year for one of them?

1. No THANK YOU AND TERMINATE
2. Yes IDENTIFY THE VEHICLE BY

License Number _____

Model Year _____

SKIP TO 6 IF IT IS A PASSENGER CAR OR A MOTOR CYCLE.

Q5. What is the gross vehicle weight, namely, the maximum loaded weight allowed for this vehicle?

1	-	6,000 pounds	.....	1
6,001	-	8,500 pounds	.....	2
8,501	-	10,000 pounds	.....	3
10,001	-	14,000 pounds	.....	4
14,001	-	33,000 pounds	.....	5
		Over 33,000 pounds	.....	6
		Do not know	.....	7

PART (A) VEHICLE USE QUESTION.

Q6. What is the registration status of this vehicle?

1. Current California License..... 1
2. Expired California License..... 2
3. Out of State License..... 3
4. Not Registered License..... 4

Q7. Approximately how long ago did you or someone in your (company/agency) last drive this vehicle?

- Being used now 1
- Less than 3 hours ago 2
- Less than 12 hours ago 3
- Less than 24 hours ago 4
- 24 hours or more (SPECIFY _____ DAYS ... 5

Q8. During the past 24 hours, approximately how many times did you or someone in your (company/agency) drive the vehicle?

COUNT THE NUMBER OF ROUND TRIPS UNLESS THE VEHICLE WAS PARKED LONGER THAN 1 HOUR DURING THE TRIP.

- None 1
- Once 2
- 2 to 4 times 3
- 5 times or more 4

Q9. Now I would like to know actual times the vehicle was first started and last parked on each of the past seven days. Starting with today, please tell me the approximate times you or someone in your (company/agency) first started and last parked this vehicle.

ASK THIS QUESTION SUCCESSIVELY FOR TODAY (D0), YESTERDAY (D1), ETC. WRITE DOWN DAY OF THE WEEK FOR EACH DAY. IF NOT USED FOR ENTIRE DAY, WRITE "N".

		D0	D1	D2	D3	D4	D5	D6	D7
Day of Week		___	___	___	___	___	___	___	___
First	AM	___	___	___	___	___	___	___	___
Started	PM	___	___	___	___	___	___	___	___
Last	AM	___	___	___	___	___	___	___	___
Parked	PM	___	___	___	___	___	___	___	___

LIMIT Q10 TO VEHICLES WHICH WERE NOT DRIVEN AT LEAST ONE DAY DURING THE PERIOD.

Q10. According to the vehicle uses you just told me, the vehicle was not driven on (SPECIFY) day. While parked during daylight hours, how much covering was there for this vehicle?

READ CATEGORIES. ASK SUCCESSIVELY FOR EACH DAY UNUSED.

	D	D	D
	1	1	1
Outdoors exposed to the sun	1	1	1
Roofed carport/shaded area	2	2	2
Enclosed garage	3	3	3

Q11. When the vehicle was totally unused on (SPECIFY) day,
approximately how full did you keep the fuel tank?

ASK SUCCESSIVELY FOR EACH DAY UNUSED

	D ₋	D ₋	D ₋
About full	1 ₋	1 ₋	1 ₋
About 1/2 full	2	2	2
Nearly empty	3	3	3

PART (B) STORAGE FACILITY QUESTIONS

Q12a. Has this vehicle ever been left overnight in an
auto-repair shop or body shop?

1. No SKIP TO Q13a
2. Yes IDENTIFY LAST TIME

When did the last such event occur:

Right now.....	1
Less than a week ago.....	2
Less than a month ago.....	3
One to six months ago.....	4
More than six months ago.....	5

Q12b. When that happened, how long was the vehicle left there?

Less than 24 hours.....	1
24 to 48 hours.....	2
48 hours or longer.....	3

IF 3, SPECIFY ____ DAYS

Q13a. Has the vehicle ever been parked overnight in a parking
lot like those at airports and bus terminals within the
four counties: Los Angeles, Orange, Riverside and San
Bernardino?

1. No SKIP TO Q14a
2. Yes IDENTIFY LAST TIME

When did the last such event occur?

Right now.....	1
Less than a week ago.....	2
Less than a month ago.....	3
One to six months ago.....	4
More than six months ago.....	5

Q13b. How long was the vehicle parked there?

Less than 24 hours.....	1
24 to 48 hours.....	2
48 hours or longer.....	3

IF 3, SPECIFY ____ DAYS

Q14a. Has the vehicle ever been parked and unused for 24 hours or more at recreational areas such as a campground, park, beach, hotel, motel, or ski area within the four counties: Los Angeles, Orange Riverside and San Bernardino?

1. No SKIP TO Q15
2. Yes IDENTIFY THE AREAS

Campground or park.....	1
Beach or wilderness.....	2
Hotel/motel but not in ski area.	3
Ski area.....	4

Q14b. Please tell me approximate dates of last such events.
(SPECIFY RECREATIONAL AREAS)

	RA_	RA_
Right now.....	1	1
Less than a week ago.....	2	2
Less than a month ago.....	3	3
One to six months ago.....	4	4
More than six months ago.....	5	5

PART (C) CLASSIFICATION QUESTIONS

Q15. Which of the following lines of business is the closet to yours?

Agriculture, forestry, and fishing	1
Mining	2
Construction	3
Manufacturing	4
Transportation, communications, electric, gas and sanitary services	5
Wholesale trade	6
Retail trade	7
Finance, insurance, and real estate	8
Services, not mentioned before	9
Public administration	10
Does not belong to any of the categories ...	11

Q16. Please briefly describe the main line of business to me.

Appendix D

Questionnaire for Vehicle Dealers

VRC TELEPHONE QUESTIONNAIRE 1060-3

CELL 1. NEW AND USED VEHICLE SALES

	Your Initial	Date	Time	Result*	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					

C = Complete (yeah!)	NQ = Not Qualified (why?)
CB = Call back (when? who? number?)	B = Busy signal
R = Flat refusal (why?)	N = No answer after 8 rings
T = Terminated midway (why?)	L = Language problem (specify)
D = Disconnected w/no new number	V = Referred to VRC
A = Answer machine/service	

OBTAIN THE NAME OF RESPONDENT AND MAILING ADDRESS AT APPROPRIATE TIME DURING THE COURSE OF YOUR INTERVIEW.

NAME: _____

ADDRESS: (IF DIFFERENT) _____

Hello, I am (...) from Valley Research Corporation. I am calling for ARB in Sacramento to study the storage patterns of new and used motor vehicles to combat air pollution. I would like to talk to the manager or person responsible for your facility.

(START HERE WITH QUALIFIED RESPONDENT)

Hello. We are conducting a survey for the California Air Resources Board to study the vehicle storage patterns of new and used vehicles in the South Coast Air Basin. May I ask you a few questions about motor vehicles at your facility?

CELL 1. NEW AND USED VEHICLE SALES

Q1. Does your company sell both new and used vehicles, new vehicles only, or used vehicles only?

1. Both new and used vehicles.....COMPLETE ALL PARTS, A, B AND C
2. New vehicles only.....COMPLETE PARTS A AND C ONLY
3. Used vehicles only.....COMPLETE PARTS B AND C ONLY

PART A. NEW VEHICLE SALES

QA2. Are there new vehicles at your location right now?

1. No.....SKIP TO QA5
2. Yes.....SPECIFY # VEHICLES BY TYPE

Please tell me how many of each type as I read various vehicle weight classes.

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

"TRUCKS" INCLUDE ALL TYPES OF VEHICLES OTHER THAN PASSENGER AUTOS AND MOTOR CYCLES

QA3. Considering yesterday, how many of the (NUMBER AND VEHICLE TYPE), would you say, were driven out of your facility for any reason?

ASK FOR EACH TYPE PRESENT (# VEHICLES)

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

QA4. How many days do these new vehicles typically sit at your location before being sold?

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....	1	1	1	1	1
2 days,.....	2	2	2	2	2
3 to 5 days,.....	3	3	3	3	3
6 to 10 days,.....	4	4	4	4	4
11 to 30 days,.....	5	5	5	5	5
or, longer than 30 days.....	6	6	6	6	6

QA5. Excluding new car preparation lots, does your company keep vehicles at other locations?

1. No.....SKIP TO QA8
2. Yes

QA6. Are there new vehicles there now?

1. No.....SKIP TO QA8
2. Yes.....SPECIFY # VEHICLES BY TYPE

_____ Autos like passenger cars and mini-vans
 _____ Light duty trucks like small pick-ups and vans
 _____ Medium duty vehicles like large pick-ups, vans,
 _____ campers, and limousines
 _____ Heavy duty trucks like motor homes, trucks, buses
 _____ and tractors
 _____ Motor cycles of both two- and three-wheels

QA7. How many days do these new vehicles typically sit at these other locations before being moved elsewhere?

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....	1	1	1	1	1
2 days,.....	2	2	2	2	2
3 to 5 days,.....	3	3	3	3	3
6 to 10 days,.....	4	4	4	4	4
11 to 30 days,.....	5	5	5	5	5
or, longer than 30 days.....	6	6	6	6	6

QA8. Right now, do you have any vehicles at a new car preparation lot such as those near a port or railway station?

1. No.....SKIP TO QA-10
2. Yes.....SPECIFY # VEHICLES BY TYPE

_____ Autos like passenger cars and mini-vans
 _____ Light duty trucks like small pick-ups and vans
 _____ Medium duty vehicles like large pick-ups, vans, campers, and limousines
 _____ Heavy duty trucks like motor homes, trucks, buses and tractors
 _____ Motor cycles of both two- and three-wheels

QA9. How many days do these new vehicles typically remain at the preparation lot? (before being brought to either your location or other holding areas)

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....1	1	1	1	1	1
2 days,.....2	2	2	2	2	2
3 to 5 days,.....3	3	3	3	3	3
6 to 10 days,.....4	4	4	4	4	4
11 to 30 days,.....5	5	5	5	5	5
or, longer than 30 days.....6	6	6	6	6	6

QA10 Compared to the inventory you have now, was your inventory in last June (July, August and September) higher, lower or about the same?

ASK FOR EACH MONTH SEPARATELY

	June	July	August	September
Considerably higher.....1	1	1	1	1
Somewhat higher.....2	2	2	2	2
About the same.....3	3	3	3	3
Somewhat lower.....4	4	4	4	4
Considerably lower.....5	5	5	5	5

IF NO USED VEHICLE SALES, SKIP TO PART C

PART B. USED VEHICLE SALES

QB2. Are there used vehicles at your location right now?

1. No.....SKIP TO QB5
2. Yes.....SPECIFY # VEHICLES BY TYPE

Please tell me how many of each type as I read various vehicle weight classes.

	Autos like passenger cars and mini-vans
	Light duty trucks like small pick-ups and vans
	Medium duty vehicles like large pick-ups, vans, campers, and limousines
	Heavy duty trucks like motor homes, trucks, buses and tractors
	Motor cycles of both two- and three-wheels

"TRUCKS" INCLUDE ALL TYPES OF VEHICLES OTHER THAN PASSENGER AUTOS AND MOTOR CYCLES

QB3. Considering yesterday, how many of the (NUMBER AND VEHICLE TYPE), would you say, were driven out of your facility for any reason?

ASK FOR EACH TYPE PRESENT (# VEHICLES)

	Autos like passenger cars and mini-vans
	Light duty trucks like small pick-ups and vans
	Medium duty vehicles like large pick-ups, vans, campers, and limousines
	Heavy duty trucks like motor homes, trucks, buses and tractors
	Motor cycles of both two- and three-wheels

QB4. How many days do these used vehicles typically sit at your location? (before being sold)

ASK FOR EACH VEHICLE TYPE PRESENT

	Light Duty Autos	Medium Duty Trucks	Heavy Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....1	1	1	1	1	1
2 days,.....2	2	2	2	2	2
3 to 5 days,.....3	3	3	3	3	3
6 to 10 days,.....4	4	4	4	4	4
11 to 30 days,.....5	5	5	5	5	5
or, longer than 30 days.....6	6	6	6	6	6

QB5. Does your company also keep used vehicles for sale at other locations?

1. No.....SKIP TO QB8.
2. Yes

QB6. Are there used vehicles there now?

1. No.....SKIP TO QB8
2. Yes.....SPECIFY # VEHICLES BY TYPE

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

QB7. How many days do these vehicles typically sit at these other locations before being moved elsewhere?

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....1		1	1	1	1
2 days,.....2		2	2	2	2
3 to 5 days,.....3		3	3	3	3
6 to 10 days,.....4		4	4	4	4
11 to 30 days,.....5		5	5	5	5
or, longer than 30 days.....6		6	6	6	6

QB8. Compared to the used vehicle inventory you have now, was your inventory in last June (SPECIFY MONTH) higher, lower or about the same?

ASK FOR EACH MONTH SEPARATELY

	June	July	August	September
Considerably higher.....1		1	1	1
Somewhat higher.....2		2	2	2
About the same.....3		3	3	3
Somewhat lower.....4		4	4	4
Considerably lower.....5		5	5	5

PART C. GENERAL

QC2. How many employees do you have in your company as a whole and how many at this facility?

Employees

Whole Company.....

This Facility.....

QC3. Your company is (READ NAME AND ADDRESS ON LABEL). Is it correct?

1. Yes

2. No.....ASK NAME AND ADDRESS

COMPANY NAME

ADDRESS

QC4. May I have your name and title?

First Name

Last Name

Title

Appendix E

Questionnaire for Vehicle Rental and Lease

VRC TELEPHONE QUESTIONNAIRE 1060-3

CELL 2. VEHICLE RENTAL AND LEASE

	Your Initial	Date	Time	Result*	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					

C = Complete (yeah!)	NQ = Not Qualified (why?)
CB = Call back (when? who? number?)	B = Busy signal
R = Flat refusal (why?)	N = No answer after 8 rings
T = Terminated midway (why?)	L = Language problem (specify)
D = Disconnected w/no new number	V = Referred to VRC
A = Answer machine/service	

OBTAIN THE NAME OF RESPONDENT AND MAILING ADDRESS AT APPROPRIATE TIME DURING THE COURSE OF YOUR INTERVIEW.

NAME: _____

ADDRESS: (IF DIFFERENT) _____

Hello, I am (...) from Valley Research Corporation. I am calling for ARB in Sacramento to study the storage patterns of new and used motor vehicles to combat air pollution. I would like to talk to the manager or person responsible for your facility.

(START HERE WITH QUALIFIED RESPONDENT)

Hello. We are conducting a survey for the California Air Resources Board to study the vehicle storage patterns of new and used vehicles in the South Coast Air Basin. May I ask you a few questions about motor vehicles at your facility?

CELL 2. VEHICLE RENTAL AND LEASE

Q1. Are there any vehicles at your location for rent or lease right now?

1. No.....SKIP TO Q4
2. Yes.....SPECIFY # VEHICLES BY TYPE

Please tell me how many of each type as I read various vehicle weight classes.

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

"TRUCKS" INCLUDE ALL TYPES OF VEHICLES OTHER THAN PASSENGER AUTOS AND MOTOR CYCLES

Q2. Considering yesterday, how many of the (NUMBER AND VEHICLE TYPE), would you say, were driven out of your location for any reason?

ASK FOR EACH TYPE PRESENT (# VEHICLES)

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

Q3. How many days do vehicles typically remain at your location before being rented or leased?

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....1		1	1	1	1
2 days,.....2		2	2	2	2
3 to 5 days,.....3		3	3	3	3
6 to 10 days,.....4		4	4	4	4
11 to 30 days,.....5		5	5	5	5
or, longer than 30 days.....6		6	6	6	6

Q4. Does your company keep vehicles for lease or rent at other locations?

1. No.....SKIP TO Q7
2. Yes

Q5. Are there vehicles there now?

1. No.....SKIP TO Q7
2. Yes.....SPECIFY # VEHICLES BY TYPE

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

Q6. How many days do vehicles typically sit at these other locations?
(before being moved elsewhere)

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....1		1	1	1	1
2 days,.....2		2	2	2	2
3 to 5 days,.....3		3	3	3	3
6 to 10 days,.....4		4	4	4	4
11 to 30 days,.....5		5	5	5	5
or, longer than 30 days.....6		6	6	6	6

Q7. In your entire fleet, does the number of vehicles not-rented-out or not-leased-out at the end of each day vary from month to month?

1. Very much vary
2. Moderately vary
3. Somewhat vary
4. Hardly vary at all.....SKIP TO Q9

Q8. Compared to the number of vehicles you have now for rent or lease, was your inventory of such vehicles in last (SPECIFY MONTH) higher, lower or about the same?

ASK FOR EACH MONTH SEPARATELY

	June	July	August	September
Considerably higher.....1		1	1	1
Somewhat higher.....2		2	2	2
About the same.....3		3	3	3
Somewhat lower.....4		4	4	4
Considerably lower.....5		5	5	5

Q9. How many employees do you have in your company as a whole and how many at this facility?

Employees

Whole Company.....

This Facility.....

Q10. Your firm is (READ NAME AND ADDRESS ON LABEL). Is this correct?

1. Yes

2. No.....ASK FIRM NAME AND MAILING ADDRESS

FIRM NAME

MAILING ADDRESS

Q11. May I have your name and title?

First Name

Last Name

Title

THANK AND TERMINATE

Appendix F

Questionnaire for Auto Repair and Body Shop

VRC TELEPHONE QUESTIONNAIRE 1060-3

CELL 3: AUTO REPAIR AND BODY SHOP

	Your Initial	Date	Time	Result*	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					

C = Complete (yeah!)
CB = Call back (when? who? number?)
R = Flat refusal (why?)
T = Terminated midway (why?)
D = Disconnected w/no new number
A = Answer machine/service

NQ = Not Qualified (why?)
B = Busy signal
N = No answer after 8 rings
L = Language problem (specify)
V = Referred to VRC

OBTAIN THE NAME OF RESPONDENT AND MAILING ADDRESS AT APPROPRIATE TIME DURING
THE COURSE OF YOUR INTERVIEW.

NAME: _____

ADDRESS: (IF DIFFERENT) _____

Hello, I am (...) from Valley Research Corporation. I am calling for ARB in Sacramento to study the storage patterns of new and used motor vehicles to combat air pollution. I would like to talk to the manager or person responsible for your facility.

(START HERE WITH QUALIFIED RESPONDENT)

Hello. We are conducting a survey for the California Air Resources Board to study the vehicle storage patterns of new and used vehicles in the South Coast Air Basin. May I ask you a few questions about motor vehicles at your facility?

CELL 3. AUTO REPAIR AND BODY SHOP

Q1. Are there any vehicles at your location for service right now? (for repair, bodywork, or painting)

1. No.....SKIP TO Q4
2. Yes.....SPECIFY # VEHICLES BY TYPE

Please tell me how many of each type as I read various vehicle weight classes.

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

"TRUCKS" INCLUDE ALL TYPES OF VEHICLES OTHER THAN PASSENGER AUTOS AND MOTOR CYCLES

Q2. How many of the (NUMBER AND VEHICLE TYPE) were there overnight? (since yesterday)

ASK FOR EACH TYPE PRESENT (# VEHICLES)

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

Q3. Have any of these vehicles stayed at your location (without being moved out of your facility) for 2 days or longer?

1. No.....SKIP TO Q4
2. Yes.....SPECIFY # VEHICLES BY TYPE

How many for 3 days or longer and 4 days or longer?

	<u>>2 DAYS</u>	<u>>3 DAYS</u>	<u>>4DAYS</u>
Autos like passenger cars and mini-vans	_____	_____	_____
Light duty trucks like small pick-ups and vans	_____	_____	_____
Medium duty vehicles like large pick-ups, vans, campers, and limousines	_____	_____	_____
Heavy duty trucks like motor homes, trucks, buses and tractors	_____	_____	_____
Motor cycles of both two- and three-wheels	_____	_____	_____

Q4. Does the number of vehicles left overnight at your facility vary from month to month?

1. Very much vary
2. Moderately vary
3. Somewhat vary
4. Hardly vary at all.....SKIP TO Q6

Q5. Compared to the number of vehicles left overnight you have now, was the number of such vehicles in last (SPECIFY MONTH) greater, fewer or about the same?

ASK FOR EACH MONTH SEPARATELY

	June	July	August	September
Considerably greater.....	1	1	1	1
Somewhat greater.....	2	2	2	2
About the same.....	3	3	3	3
Somewhat fewer.....	4	4	4	4
Considerably fewer.....	5	5	5	5

Q6. How many people work at your facility, including those of management and administration?

NUMBER _____

Q7. How many of these are mechanics or other technical staff?

NUMBER _____

Q8. Your firm is (READ NAME AND ADDRESS ON LABEL). Is this correct?

1. Yes
2. No.....ASK FIRM NAME AND MAILING ADDRESS

FIRM NAME _____

MAILING ADDRESS _____

Q9. May I have your name and title?

First Name

Last Name

Title

THANK AND TERMINATE

Appendix G

Questionnaire for Scrap and Dismantling

VRC TELEPHONE QUESTIONNAIRE 1060-3

CELL 4: SCRAP AND DISMANTLING SHOP

	Your Initial	Date	Time	Result*	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					

C = Complete (yeah!)	NQ = Not Qualified (why?)
CB = Call back (when? who? number?)	B = Busy signal
R = Flat refusal (why?)	N = No answer after 8 rings
T = Terminated midway (why?)	L = Language problem (specify)
D = Disconnected w/no new number	V = Referred to VRC
A = Answer machine/service	

OBTAIN THE NAME OF RESPONDENT AND MAILING ADDRESS AT APPROPRIATE TIME DURING THE COURSE OF YOUR INTERVIEW.

NAME: _____

ADDRESS: (IF DIFFERENT) _____

Hello, I am (...) from Valley Research Corporation. I am calling for ARB in Sacramento to study the storage patterns of new and used motor vehicles to combat air pollution. I would like to talk to the manager or person responsible for your facility.

(START HERE WITH QUALIFIED RESPONDENT)

Hello. We are conducting a survey for the California Air Resources Board to study the vehicle storage patterns of new and used vehicles in the South Coast Air Basin. May I ask you a few questions about motor vehicles at your facility?

CELL 4. SCRAP AND DISMANTLING

Q1. Are there any vehicles at you location for impound, scrap, or dismantling right now?

1. No.....SKIP TO Q5
2. Yes.....SPECIFY # VEHICLES BY TYPE

Please tell me how many of each type as I read various vehicle w ight classes.

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

"TRUCKS" INCLUDE ALL TYPES OF VEHICLES OTHER THAN PASSENGER AUTOS AND MOTOR CYCLES

Q2. Of those vehicles, how many vehicles are likely to have some amount of gasoline left in their fuel tanks?

ASK FOR EACH TYPE PRESENT (# VEHICLES)

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

Q3. How many of these vehicles with gasoline were there overnight? (since yesterday)

ASK FOR EACH TYPE PRESENT (# VEHICLES)

_____	Autos like passenger cars and mini-vans
_____	Light duty trucks like small pick-ups and vans
_____	Medium duty vehicles like large pick-ups, vans, campers, and limousines
_____	Heavy duty trucks like motor homes, trucks, buses and tractors
_____	Motor cycles of both two- and three-wheels

Q4. How many days do these vehicles typically sit at your location? (before being dismantled or moved elsewhere)

ASK FOR EACH VEHICLE TYPE PRESENT

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....	1	1	1	1	1
2 days,.....	2	2	2	2	2
3 to 5 days,.....	3	3	3	3	3
6 to 10 days,.....	4	4	4	4	4
11 to 30 days,.....	5	5	5	5	5
or, longer than 30 days.....	6	6	6	6	6

Q5. Does your company keep impounded, scraping or dismantling vehicles at other locations?

1. No.....SKIP TO Q8 (OR Q10)
2. Yes

Q6. Are there such vehicles there right now?

1. No.....SKIP TO Q8
2. Yes.....SPECIFY # VEHICLES BY TYPE

_____ Autos like passenger cars and mini-vans
 _____ Light duty trucks like small pick-ups and vans
 _____ Medium duty vehicles like large pick-ups, vans,
 _____ campers, and limousines
 _____ Heavy duty trucks like motor homes, trucks, buses
 _____ and tractors
 _____ Motor cycles of both two- and three-wheels

Q7. How many days do these vehicles typically sit at these other locations before being dismantled or moved elsewhere?

	Autos	Light Duty Trucks	Medium Duty Vehicles	Heavy Duty Trucks	Motor Cycles
1 day,.....	1	1	1	1	1
2 days,.....	2	2	2	2	2
3 to 5 days,.....	3	3	3	3	3
6 to 10 days,.....	4	4	4	4	4
11 to 30 days,.....	5	5	5	5	5
or, longer than 30 days.....	6	6	6	6	6

Q8. Does the number of gasoline retaining vehicles left overnight at your facility vary from month to month?

1. Very much vary
2. Moderately vary
3. Somewhat vary
4. Hardly vary at all.....SKIP TO Q10

Q9. Compared to the number of these vehicles you have, was the number of such vehicles in last (SPECIFY MONTH) greater, fewer or about the same?

	June	July	August	September
Considerably greater.....	1	1	1	1
Somewhat greater.....	2	2	2	2
About the same.....	3	3	3	3
Somewhat fewer.....	4	4	4	4
Considerably fewer.....	5	5	5	5

Q10. How many employees do you have in your company as a whole and how many at this facility?

Employees

Whole Company _____

This Facility _____

Q11. Your firm is (READ NAME AND ADDRESS ON LABEL). Is this correct?

1. Yes
2. No.....ASK FIRM NAME AND MAILING ADDRESS

Firm Name _____

Mailing Address _____

Q12. May I have your name and title?

First Name

Last Name

Title

THANK YOU AND TERMINATE

Appendix H

Questionnaire for Parking and Camping

VRC TELEPHONE QUESTIONNAIRE 1060-3

CELL 5: PARKING AND CAMPING

	Your Initial	Date	Time	Result*	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					

C = Complete (yeah!)
 CB = Call back (when? who? number?)
 R = Flat refusal (why?)
 T = Terminated midway (why?)
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 A = Answer machine/service

NQ = Not Qualified (why?)
 B = Busy signal
 N = No answer after 8 rings
 L = Language problem (specify)
 V = Referred to VRC

OBTAIN THE NAME OF RESPONDENT AND MAILING ADDRESS AT APPROPRIATE TIME DURING THE COURSE OF YOUR INTERVIEW.

NAME: _____

ADDRESS: (IF DIFFERENT) _____

Hello, I am (...) from Valley Research Corporation. I am calling for ARB in Sacramento to study the storage patterns of new and used motor vehicles to combat air pollution. I would like to talk to the manager or person responsible for your facility.

(START HERE WITH QUALIFIED RESPONDENT)

Hello. We are conducting a survey for the California Air Resources Board to study the vehicle storage patterns of new and used vehicles in the South Coast Air Basin. May I ask you a few questions about motor vehicles at your facility?

CELL 5: PARKING AND CAMPING

Q1. How many parking apaces are there in the facilities under your (COMPANY'S/AGENCY'S) management?

- Less than 20 vehicle spaces 1
- 20 to 50 vehicle spaces 2
- 51 to 100 vehicle spaces 3
- 101 to 500 vehicle spaces 4
- over 500 vehicle spaces 5
- Do not know (DON'T READ THIS OPTION) 6

Q2. Are these parking spaces used exclusively for a specific vehicle type such as autos only, trucks only, or recreational vehicles only?

- 1. No
- 2. Yes.....SPECIFY VEHICLE TYPE _____

Q3. What percent of these parking spaces are allowed to park vehicles for 24 hours or longer?

- All spaces1
- About a half of the spaces (50%)2
- About a quarter of the spaces (25%) 3
- About 10 percent of the spaces 4
- None 5
- Do not know (DON'T READ THIS OPTION) 6

Q4. Considering a recent day of parking situation, approximately how many vehicles are left overnight in your parking facility.

- None 1
- 1 to 5 vehicles 2
- 6 to 10 vehicles 3
- 11 to 50 vehicles 4
- 51 to 100 vehicles 5
- over 100 vehicles 6
- Do not know (DON'T READ THIS OPTION) 7

Q5. Compared to the number of overnight parked vehicles you have now, was the number of such vehicles in last (SPECIFY MONTH) greater, fewer or about the same?

	June	July	August	September
Considerably greater 1	1	1	1	1
Somewhat greater 2	2	2	2	2
About the same 3	3	3	3	3
Somewhat fewer 4	4	4	4	4
Considerably fewer 5	5	5	5	5
Do not know (DON'T READ THIS OPTION) 6	6	6	6	6

Q6. Do you keep parking records of your facility?

1. No SKIP TO Q8
2. Yes

Q7. Will you let us examine past parking records of a week or so on request?

1. No
2. Yes
3. May be

Q8. How many employees do you have in your (COMPANY/AGENCY) as a whole and how many at this facility?

Employees

Whole Company.....

This Facility.....

Q9. Your company is (READ NAME AND ADDRESS ON LABEL). Is this correct?

1. Yes
2. No.....ASK NAME AND ADDRESS

FIRM NAME _____

MAILING ADDRESS _____

Q10. May I have your name and title?

First Name

Last Name

Title

